CHEETAL

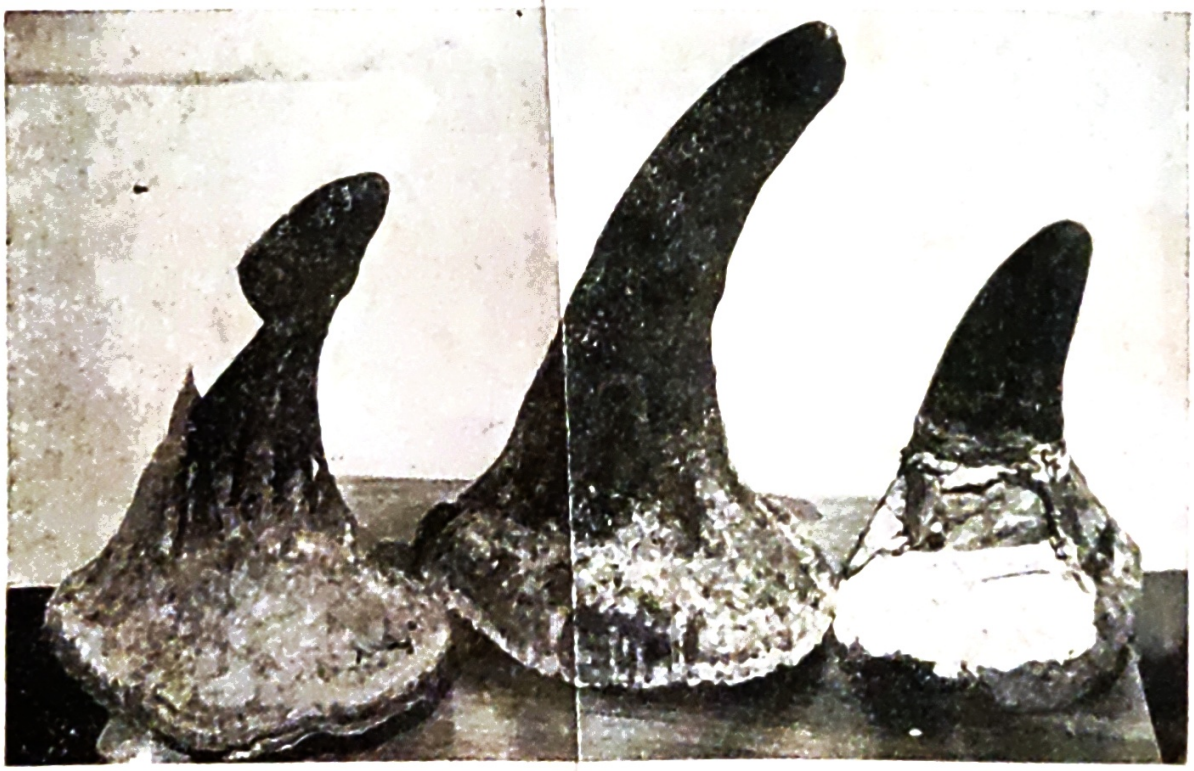
JOURNAL OF

The Wildlife Preservation Society of India

Vol. 23 June, 1982 No. 4

HRH Prince Bernhard of the Netherlands, who is the founder President of the World Wildlife Fund (Extreme left), with the Prime Minister, Shrimati Indira Gandhi, after conferring on her the "Order of the Golden Ark—Commander", the highest decoration for her leadership in the field of environmental conservation and her personal commitment to the preservation of flora and fauna, in New Delhi on May 18, 1982.

Kaziranga Rhino wallowing in mud. In the background is the thick impenetrable tall grass through which the animal has to tunnel its way to warder about. Poachers make pits on the tracks to kill Rhinos for their horns.



Three horns in the custody of the Assam Forest Department. The one on the extreme right is a fake one. Horn of a domestic cattle mounted on a cement base and suitably coated to resemble the base of a genuine horn is passed on as genuine stuff. Defective coating has peeled off exposing the spurious character. The one in the middle—a genuine one—weighs a little over a kg and its present spot price would be around Rs. 70,000/- (Rs. seventy thousand).

(Reference Article on Page 10)

—Photo Shri S.P. Sahi

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(Prime Minister Mrs. Indira Gandhi's Message on the occasion of the Wildlife Week, October 1-7, 1982)

प्रधान मंत्री, भारत

PRIME MINISTER, INDIA

Message

The conservation of wildlife has acquired urgency for it is relevant for human survival. Such are the linkages between various species in Nature that the elimination of any one species creates problems in others sooner or later. Humankind has already destroyed many species. Let us not do more harm.

India has always seen life as one. We should set an example in conserving wildlife. My good wishes to Wildlife Week. I should like our children especially to know more about indigenous flora and fauna so that they can feel the oneness and wholeness of life and contribute to a better future for all living creatures.

(Sd/- Indira Gandhi)

New Delhi

July 16, 1982

A tree is known by the fruits it bears;

A forest is known by the animals it rears.

Come and see it for yourself

Visit:

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&

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BIHAR

For details please Contact:—

1. **Divisional Forest Officer,**
Daltonganj South Division,
At & P.O. Daltonganj,
Dist. Palamau (Bihar).

2. **Divisional Forest Officer,**
Hazaribagh West Division,
At & P.O. Hazaribagh,
(Bihar)

The Golden Ark

"The conservation of Man is dependent on the conservation of animals and plants"
—Indira Gandhi.

His Royal Highness Prince Bernhard of Netherlands, the founder President of World Wildlife Fund and Grand Master of the Order decorated Srimati Indira Gandhi— Prime Minister of India, at a simple ceremony at the residence of the Ambassador of Netherlands with the order of the Golden Ark the highest conservation award for her unequivocal leadership in the field of environmental conservation and her personal commitment to the preservation of India's flora and fauna.

On the occasion the citation read as "The order of the Golden Ark is awarded to Shrimati Indira Gandhi, Prime Minister of the Republic of India for her unequivocal leadership in the field of environmental conservation and for her personal commitment to the preservation of India's wild treasures."

In his speech the Prince commended Shrimati Indira Gandhi for her great effort in doing something outstanding to save the tiger. Under her, India had taken the lead in saving and protecting the tiger.

Shrimati Gandhi accepted the decoration on behalf of all the friends of flora and fauna in India. Accompanying her were Shri Rajiv Gandhi and his wife Sonia.

Prince Benhard spoke of the conflict between poverty and conservation. The developing countries were grappling with the problem of deforestation because of need of fuel for the poor.

The order of the Golden Ark was established in 1971 by Prince Bernhard to honour persons for their outstanding contribution in the conservation of Wildlife. There are three grades of the order, Knight, Officer and Commander which is the highest.

Others decorated with the order are the King of Sweden, Prince Phillip, Dr. Julius K. Nyerere. Other Indians decorated were Dr. Salim Ali, officer in the order, Shri Arjan Singh knight and Mrs. D.S: Variava knight.

The decoration displaying Golden Ark on a blue enamelled background is worn on a yellow and orange striped ribbon.

Receiving the honour, Shrimati Gandhi said:—

"Prince Bernhard's work and concern for wildlife is well-known, I feel privileged to accept the Order of the Golden Ark. What a beautiful thought and a beautiful name !

My own involvement with flora and fauna preceded any ideas on conservation. As a child I felt closeness to the earth. When I began to read, I found an echo in D.H. Lawrence's words: "I am part of the Sun as my eye is part of me. That I am part of the earth my feet know perfectly, and my blood is part of the Sea.....My soul is an organic part of the great human soul as my spirit is part of my nation..... I am part of the great whole and, I can never escape".

In my world, animals and plants played an important part. Human contacts are through the intermediary of the spoken word, which is so often misconstrued. Also, they are largely governed by thinking and behaviour, which pre-conditioned by social or other circumstances. With animals and plants I could be totally myself.

In India we are fortunate in having a long tradition of protection of animals and of feeling for plants. In ancient times cow protection was an economic necessity. Giving tt a religious aspect emphasised its importance to the community. Similarly, flowers were integral to religious rites, and plants were used not only for food but for medicinal and other purposes. Ashoka, who was emperor in the 3rd Centuary B.C. has left edicts on rocks and pillars, enjoining upon us to treat animals with kindness and care.

From this globe, humankind has reaped rich harvest in food, in goods, in knowledge. Yet avarice drives it on, heedless of the injury caused to other living creatures and to earrh itself. Immediate pressures of economic development, of growing population and the understandable and increasing demands of people who have long been denied equality and justice are in conflict with the need for preservation and conservation. We must find ways of reconciling these different aspects.

Nature has tremendous capacity for renewal. The Wild Life Movement is making a gallant effort to help the process by rekindling awareness and concern. And in this field your Royal Highness has played a very big part.

I thank you once again and the foundation. May I aecept the award on behalf of all friends of flora and fauna in India."

The acceptance of the well deserved decoration of 'The Golden—Ark' by Shrimati Indira Gandhi was not only an honour conferred on her but also to the Institution that conferred the honour. It was the recognition of the great work done in saving the tiger for posterity from extinction. Under her inspiration and guidance the Government of India and the states launched "Project Tiger" and the number and the area of Tiger Reserves under Project Tiger has been increasing".

Ever since Project Tiger was launched hopes for survival of tiger have been burning bright. Project Tiger not only saves the tiger for posterity but also the entire eco-system of the tiger reserve. The tiger's associates—animals and plants have also been protected in the areas concerned. Tiger is the spirit of the Indian jungle.

Excellent was the selection of Kailash Sankhala as the first Director of Project Tiger. Sankhala has immense experience of the tiger—in the wild as well as in captivity. His enthusiasm and expert knowledge put Project Tiger on a sound footing and Sankhala's name will go down in history as long as the Tiger survives and even after that in books and tiger lore.

In our country things are often done on the initiative of the Government and under Indira Gandhi this initative was not lacking rather it was active and consistent. Though of course there are persons in India who would like all tigers to be slaughtered as some of them turn man-eaters through compulsion.

At the closing session of the International Symposium on Tiger on February 1979 at New Delhi Shri S.K Roy (Indian Foreign Service (Retd.) and Vice President of Wildlife Preservation Society of India, moved that an appreciation of Shrimati Indira Gandhi for her initiative in launching Project Tiger for preserving the Tiger for posterity be recorded. The suggestion was not supported rather it was ignored and other speeches went on. Why ?

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Publications Received

1. Scottist Forestry.
2. Conservationist.
3. Ecoforum
4. I.F.S.A.-News letter
5. Parks-(I.U.C.N.)
6. Wild Life News Letter
7. Nainital Mountaineering Club—News Letter
8. B.N.H.S. Journal
9. Animal Citizen (Animal Welfare Board)

Books

CORBETT NATIONAL PARK: Ramesh Bedi; Saraswati Vihar; New Delhi; Pp 189; Rs. 50.

If you are a wildlife enthusiast, if you want to know how to enjoy a visit to any wildlife area, if you have not seen wildlife in its natural glory, if you are planning to go to Corbett National Park or you want to visit it but are unable to do so for the present, and if you have been to the National Park and wish to relive the pleasant memories of your stay there, here is the book for you.

Illustrated with photographs internationally reknowned Rajesh and Naresh Bedi, the book straight away takes the reader to the times when the idea of creating a wildlife preserve was conceived. Gradually, the reader floats through the time and lands in the Corbett National Park of today.

Ramesh Bedi has described almost all aspects of the National Park including the description of the tract, fauna, flora, neighbouring areas outside the Park, problems of wildlife and forest management, various routes to visit the Park, problems that one can expect, proper time to visit, arrangements for stay etc., in a very simple and lucid language.

Ramesh Bedi has done a great service to the great multitude of Hindi readers for whom Jim Corbett is a hero by including a brief life-sketch of the great and humane hunter-conservationist.

The book is technically sound, well documented, informative and immensely readable and will prove an asset to any wildlife lover including the foresters all over India.

Vinod Rishi

* * *

TARA—A Tigress, Arjan Singh; Quartret Book; 1981, LONDON, Melbourn, New York.

In July 1976 Arjan Singh arrived at Twycross Zoo to collect a young tiger cub. Tara then known as jane, was a hand reared cub which he hoped to return to the wild. After a long and difficult journey, the tigress arrived at Tiger Haven in India in the middle of September and the story of her gradual acclimatisation to her natural habitat began. Eventually, at the age of twenty months and ten days, Tara opted for a life completely in the wild and Arjan Singh's project had achieved its aim.

The story of Tara's development is a faccinating one. From the build-up of her relationship with Eelie the dog and Herriet the leopardess, though her early attempts at eating a porcupine and her surprise encounter with a bear to her first kill of a sambar fawn, the reader will be spell-bound. Affectionate but never sentimental this is a book which will delight everyone.

Arjan Singh has achieved a notable success in the field of Wildlife Preservation and has opened a new vista in the possibility of the reintroduction of endangered species. His book is a must for professional and animal enthusiast alike.

* * *

THE TIGER, SYMBOL OF FREEDOM, Nicholos Courtney; Quartret Books, London, Melbourn, New York 1980.

From pre-historic times to the present day, the tiger's unique combination of grace and strength has held a fascination for mankind.

Immortalized by painters, incorporated into coats of arms, hunted by rajahs and written about by men as diverse as Blake and Kipling, the tiger is the uncrowned king of the beasts. Nicholas Courtney's interest in this magnificent animal was stimulated at an early age. Over the years, he has delved deeply into his history and symbolism. The tiger—'Symbol of Freedom' describes how this endangered species lives in its natural state, as well as its role in legend, art and literature.

At a time when the tiger is in danger of extinction, Mr. Courtney spotlights the many reasons why this tragedy must be averted. Charles (Chuck) McDougal, Director of Operation and Chief Naturalist at Tiger Tops Jungle Lodge in the Royal Chitawan National Park, Nepal, has contributed an excellent foreword which stresses the need for expansion in the conservation programme if we are to preserve this most beautiful of creatures.

* * *

World Wildlife Fund (India)

As a service to the sustainable utilisation of renewable resources, the Data Centre for Natural Resources, World Wildlife Fund—India, will issue "WILDLIFE DATA CENTRE ABSTRACTS" as a bi-monthly issue, each containing abstracts of 200 articles. The subscription towards six issues of one calendar year will be Rs. 25/-. The first subscription will be Rs. 30/- and will include one issue of 1982 in addition to six of 1983.

Please send your subscriptions by Demand Draft or Postal Order on Bangalore Payable to DATA CENTRE for NATURAL RESOURCES, by 1st November, 1982 to:

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The Data Centre already has over 2,000 articles indexed under keywords and will add more to this collection than the 200 abstracts which will be listed every 2 months. Enquiries on any subject will be attended to promptly on payment of modest search fees.

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Alarm Call by Great Indian Rhino (*Rhinoceros unicornis*)

KEDAR N. BAIDYA*

Dy. Conservator of Forests, Karnataka State, India

The Government of India's recent plan to translocate a few great Indian rhinos to some other potential habitat, has caused fresh controversy in the already politically strife torn North-Eastern Assam State.

The great Indian one horned rhinoceros (Rhinoceros unicornis), an animal once at the point of extinction, is still a major force in tourist attraction for visitors to the marshy and difficult Kaziranga Sanctuary of the state.[1] In spite of the enforcement of a tough anti-poaching protection law (Indian Wildlife Act 1972), the magnificent animal is still under severe threat, for its horn.[2] The single horn, when fully developed, may weigh up to 1½ kg (max.) in maturity with a length up to 12 inches. It is believed, that when powdered, the horn has high aphrodisiac potential and it is much valued by groups of Asiatic people.[3] Amongst the mongoloid group of people in Asia, the powdered rhino horn is believed to be an aphrodisiac, which it is not; whereas the North Yemeni tribesmen take pride in carrying daggers with decorative rhino horn handles.[4]

Coming back to the political issue, the Assam protestors argue that the scheme to remove the rhino is designed at gradually stripping the State of an important tourist attraction. A section of militant students, in their recent protest note to the Prime Minister, Mrs. Indira Gandhi, mentioned that the proposed translocation scheme of the Kaziranga rhino which they call "Assam Rhino" in any other reserve outside Assam, is a "conspiracy to deprive the people of Assam of an object of their hereditary pride". The agitated student groups are receiving support from local parochial and jingoistic politicians, so called 'conservationists', and wildlife officials. The issue has involved demanding the eviction of illegal immigrants, mostly from Bangladesh (and a certain percentage from West Bengal too) who the Assamese think, are swamping their linguistic and cultural identity.

The wildlife authorities in New Delhi, to their utter surprise at the controversy, have the view that the rhino translocation programme is based on sound conservation principles. They say that Kaziranga Sanctuary, whose total area is about 425 sq kms,[5] is overstocked with rhinos and they must be shifted to a new suitable habitat.

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The recent rhino population estimate shows that there are 1200 animals in India, and 960 of them are in Kaziranga alone. Reflecting back, Kaziranga was established as a Sanctuary in 1908, when there were about a dozen of the animals in the reserve. Poaching, encroachment of the habitats by man, drying of wetlands, all together contributed to push the magnificent animal into small isolated pockets of the Savannah Swamps of Kaziranga and the foothill forests in West Bengal and Nepal.

Though the scientists say that there are no aphrodisiac properties in rhino horn, poaching of rhinos has not stopped. The officials of Kaziranga Sanctuary admitted that 40 rhinos had been killed during 1981. The Indian Wildlife authorities believe that by 1900 the Javan one horned lesser rhinoceros became extinct and its other counterpart the Sumatran two horned rhinoceros vanished by 1935. The Indign authorities are seriously considering methods of preventing extinction of the species (Rhinoceros unicornis) and that is why they are in favour of translocation of a few potential animals to other suitable habitats.[6] The experts recommended last year that six rhinos should be lifted out of Kaziranga aud introduced in the Dudhwa National Park in the Northern State of Uttar Pradesh. A few more could be translocated at a later stage in State Reserves of northern part of West Bengal.

Some sections of Assamese Wildlife officials think the rhino may not be able to survive the threats from poachers who are rampantly dominant both in the Dudhwa and North Bengal forest areas. Their suggestion is to resettle the rhinos in about 20 other forest reserves within Assam, which they say, would provide an ideal habitat for the species.

The translocation experiment of rhinos to Dudhwa was expected to start by next winter and this could perhaps be the starting point of similar projects involving other endangere Indian species. It may perhaps be worth mentioning India's most recent notable conservation success programme—'the project tiger' which was launched in 1973 to save the magnificent big cat from extinetion.[7] Rigid protective measures have helped increase the tiger population both in the wild and the reserves. The recent (1981) estimates of population show 3015 animals, whereas the initial (1972) count was only 1844.[8]

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A Note on Kaziranga

By

S.P. Shahi*

On Kaziranga Rhinos, Cheetal's issue of March, 1982: No. 3, states "Recently more than thirty carcases of rhinos were discovered in Kaziranga. They did not die of any disease as their horns had been chopped off—apparently the work of poachers whom the enforcement staff failed to catch". The magazine goes on to comment ".....as Assam seems to be unable to protect the rhinos in Kaziranga; the translocation would give the species a better chance of survival".

I was in Kaziranga between the period 15.5.1982 to 18.5.1982. Rhino's population based on actual physical count in the years 1966, 1972 and 1978 (at six years interval) stood at 366, 658 and 939 respectively. Next census is due only in 1984. The projected population to date appears to be around 1060 rhinos. Records further show that this great one-horned rhino was abundant in the dynamic habitat carrying the natural mix of riverain woodland, flood plain grasslands and swamps, till the end of the last century. Senseless slaughter by poachers and hunters decimated the population to less than a dozen in 1904. Kaziranga with an area of 433 sq kms was declared a Sanctuary in 1916 with the primary objective of preserving the rhinoceros. It got the status of National Park around 1970, when the Assam National Park Act received the assent of President of India in mid 1969. Wildlife (Protection) Act 1972, now applies to the area and rhino is under Schedule 1 of the Act.

During the period 1966-78 for which population figures have been provided above, records reveal that total number of natural deaths (predation, old age, con-specific combat) was 401 and the number of rhinos poached over this twelve-year period was 63. In spite of these deaths the net increase in population has been 573 in 12 years—an annual gain of 48 rhinos in the population. There is, therefore no causes for concern at the moment of rhino population having been decimated either by natural deaths or poaching.

All rhino horns of natural deaths should, it is presumed be collected by the local administration if they are vigilant and honest. Horns collected up to 1978 were disposed off by periodic competitive sales. There has, however, been no sale after 1978. The following figures for the three years 1979, 80 and 81 are relevant:-

Year	**Natural deaths**	**Horns recovered**	**Calves** (dead)
1979	19	16	2
1980	58	44	12
1981	38	23	14
	115	83	28

*Author is a former Chief Conservator of Forests, Bihar. A member of the Indian Board for Wildlife, is its Regional Representative for Eastern and North-Eastern India.

Calves do not develop horns until they are 3 years old. Recovery of 83 Numbers of horns out of 87 adults that had natural deaths gives a recovery percentage of 95.4%. This is a commendable achievement by any standards. Two facts emerge undisputedly, namely (a) population has increased from the all-time rhino low of less than a dozen in 1904 to over a thonsand now (1982) and that (b) natural deaths are detected and their horns collected and accounted for.

It is also perhaps not fully appreciated that in spite of the burning of grasses from December to February, they (Arundo *donax, Phragmites karka, Erianthus spp etc*) grow very fast into tall thick mass and rhinos who are great wanderers, have to tunnel their way through them leaving innumerable tracks that they use over and over again. It is on these tracks that poachers dig pits, camouflage them with thin branches and the heavy rhinos fall in the pits and die and the poachers cut away their horns. Such tracks can only be petrolled by means of elephants. In this ideal rhino habitat, the petrolling staff is thrown at a disadvantage due to inadequate number of elephants. It indeed, goes to the credit of the administration that they have succeeded so far in maintaining an increasing population growth.

There has, however, been a sudden spurt in poaching incidences in the two years 1980 and 1981. As against 11 animals poached in 1980, as many as 25 animals were poached in 1981. While the poaching percentage in 1978 was a mere 0.6% it has increased to 2.38% (four times) in 1981. This adverse unexpected situation has to be nipped in the bud to prevent the present happy position about population increase taking a negative trend.

Dr. Bradley-Martin's research carried out in China, India, Hongkong, Taiwan and North Yemen and several other Asian countries, has dispelled the long held myth that Asians prize the horn as an aphrodisiac. Instead Dr. Bradley-Martin found that they use it mainly as a fever reducing drug—a vital piece of knowledge that may lead to the provision of alternatives. This Study reveals that "there is a booming market for African rhino horn in North Yemen where it is used to make the handles of traditional daggers. Apparently Yemenis—returning with their savings from neighbouring Saudi Arabia—are prepared to pay top prices for the real thing. One reason why the whole sale price of rhino horn has rocketed twenty-fold over the past five years" source IUCN Bulletin November/December 1980 (Vol. 11, No. 12). While in 1978, the auction price of per kg of rhino horn was Rs. 16,000/- (Rs. sixteen thousand) the highest offer received by the Assam Forest Department, only two years later was Rs. 62,500 per kg in 1980—no sale was done, however. I will not therefore be surprised if this sudden rise in poaching is also connected with demand in North Yemen and may be in other Gulf countries Temptation to make quick money is too great amongst poachers.

The mighty Brahmaputra river flows along the northern boundary of the Park and the river Mora Diflu along the southern boundary. Poachers come from the northern bank of Brahmaputra in disguise as fishermen. Fishing licences are issued by another Department of Govt, who obviously are not aware of the gravity of the 1981 poaching situation. 50 kms of Brahmaputra forms the northern boundary and it is imperative that no fishing should be permitted over this stretch of the river. The situation is further aggravated by the fact that there are a number of *Chapories* (riverain islets and accretions) permitted to be occupied by Gov't by professional graziers. Rhino poachers find easy shelter in such places—all on the southern bank of Brahmaputra facing the Park. Natural succession of vegetation should be allowed to take its own course in these new islets in the interest of management of large herbivores like rhinos and elephants. Graziers must not be allowed to use these islets which not only disturbs the course of vegetative succession but provides bases for poachers to operate. A political dec sion at State level is needed on this. For patrolling 50 kms of Brahmaputra that forms the northern boundary, there are only nine posts without any facility of fast boats to negotiate the heavy current of Brahmaputra. At least twenty posts and two jet boats would be required if poachers have to be dealt promptly. Similar inadequacy of staff exists along the south eastern boundary of the Park, from Dhanbari area of Agartali range to Kaziranga beat over a length of 30 kms distance through which poachers entire the Park.

At least forty elephants would be required to be so permanently stationed inside the Park as to facilitate surveillance of the innumerable rhino tracks made by a thousand rhino amidst tall grasses. At present, to cater to the needs of the tourist traffic, forestry personnel and elephants, are in constant heavy demand to the detriment of the required intensity of field duties. A whole time officer of the rank of an Assistant Conservator of Forests exclusively for anti-poaching opera tions with control over the forty elephants and anti-poaching ground staff will improve matters.

Before putting the wildlife staff on the mat, facilities such as those mentioned above have to be provided to curb this sudden spurt in poaching.

Translocation of rhinos to Dudhwa N.P. is an independent issue—the creation of a second homeland for the Indian Rhino. One need not run down the Kaziranga administration to find additional arguement for translocation.

———

Bird Life in Ghana Bird Sanctuary, Bharatpur (India), Before and After the 1979 Drought

Abraham Verghese, A.K. Chakravarty and R.K. Bhatnagar

Abstract

Bird life of the Ghana Bird Sanctuary was studied before and after the 1979 drought with a view to decrease the adverse effects on birds, in case of a drought, in future. The Sanctuary perhaps had the least number and species of water birds, it ever had, following the 1979 drought. Water birds seemed disorganised and tended to crowd. Food as a niche requirement was the most limiting factor. Interestingly, water birds changed their foraging strategy to remain in the sanctuary. Piscivores was the most severely affected bird-group. Of the four agents of disturbance, birds-of-prey disturbed waterfowl the most. The density of wader birds increased. Shrikes, babblers and other species that prefer scrub, also increased. Repeated onslaughts of such drought may adversely affect the birds but infrequent occurrence may be favourable.

Introduction

The Bharatpur Bird Sanctuary in Rajasthan (26° 45′ N, 73° 30′ E), is India's most popular bird refuge with over three hundred resident and migratory birds which have been listed by Saxena (1975). It attracts sizable crowds of international tourists.

The sanctuary predominantly consists of inundated tracts, housing a variety of ducks, teals, rails, storks, cranes and other kinds of waterfowl. Because of the scrub, marsh and woody habitats found here, the sanctuary harbours a variety of waders and terrestrial birds.

The sanctuary was visited in November and December of 1978 (RKB) and in February and March of 1979. During 1978 and early 1979 conditions were normal. In 1979, due to monsoon failure, a severe drought prevailed in the sanctuary. Reports that migrant birds were scarce or absent were publicised by the news media. This prompted a revisit to the sanctuary in November 1979. The findings of the second survey were compared with the notes taken during the first visit and the differences observed are presented in this paper.

Brief History

Ghana, also called 'Keola Dev' after a temple diety of the same name, is the most famous of Indian bird sanctuaries. It's renown is due to the assemblages of water birds, both resident and migratory.

Although historical records are few, it may be assumed that sentiment was behind the protection given to birds and mammals of the Ghana. Later the same birds and mammals were carefully looked after so that they might provide the Rajah and his guests with sport. Old shooting records of this area are inscribed on stone plaques from 1902 to 1973 inside the sanctuary. These records reveal that the number of guns used for a single day's shoot ranged from 11 to 79 and the number of bagged birds ranged from 76 to 4273 ducks. This further points to the enormous concentration of birds even 40 years ago. Inspite of the heavy shooting pressure birds have always flocked to the Ghana.

Bharatpur was given the legal status of a bird sanctuary in 1973. Since that date it is completely protected and is now under the management of the Forest Department of Rajasthan.

Climate and Vegetation

Bharatpur has three distinct seasons: summer, monsoon and winter. Most of the precipitation occurs during the monsoon. Rain is the major source of water for the sanctuary. Rainfall is light and varies from 30-60 mm per year. Temperature generally does not rise above 18°C during night and above 27°C during day during the monsoon (Fodor and Curtis, 1974). During this period, the water supports a luxurious growth of vegetation. Saxena (1975) has listed the flora of this area. The survey revealed that the most dominant vegetation is basically scrub: *Acacia nilotica*, *Acacia arabica* and *Zizyphus mauritiana* with vast tracts of inundated swamps. Attempts are now being made to plant *Acacia* sp. and other tall trees on mounds near observational points to provide additional roosting and nesting sites for birds.

Most of the migrants arrive at the beginning of the winter (November-January). Waterfowl numbers reach a peak during winter due to the sum effect of the off springs of nesting birds and the influx of migratory birds. In summer, the Ghana starts drying up, but it is seldom completely dry. By June, most migratory birds leave the sanctuary.

Water and Birds

Water received during the monsoon is collected in a dam from catchment areas. With this nearly 80% of the sanctuary area is inundated up to an average level of about 1.5 m. Generally the rain is spread over the entire monsoon with a peak in June-July. During the year 1979, however, only 12 mm rain was received in two showers in localised patches during October and November. Because of this extremely low precipitation there was a tremendous reduction of inundated areas.

Study areas

The sanctuary (2,900 sq. km) is about 3 miles south-east of Bharatpur. The soil is silty loam, rich in potassium but deficient in other nutrients This ecosystem consists of water

bodies separated by mud roads. A part of the sanctuary is wooded, mainly with *Acacia* spp. For convenience we divided the sanctuary into eight parts (Table 1).

Table 1

Description of the study area before and after the 1979 drought

Area	Description during	
	January-March, 1979	November, 1979
1	2	3
Neel Tal	Water depth—1.5 m. Area supporting floating, emergent and submergent vegetations. Water birds like teals, coots and dabchicks in plenty.	Dry conditions. Trees dried-up. Dead shells of *Limna* sp. and *Pila* sp. Birds (e.g. parakeets, bulbuls, bablers) prefering dry and scrub conditions frequenting in abundant numbers. Dung and hoof prints suggestive of grazing.
Baklaya—I	Shallow water area, supporting more vegetation than Neel Tal. At fringe areas thick stand of weed plants and grasses (e.g. *Saccharum* sp.). Waterfowl in large numbers.	Wet areas in pockets. Lapwings, babblers, sandpipers, waterhens etc. in large numbers. Waterfowl scarce.
Baklaya—II	Shallow water area. Vegetated area more interspersed with open water areas. More waterfowl.	Water along the main road up to 0.6 m. Small numbers (< 25) of birds.
Jatoli Canal	Perhaps the most	Perhaps the least affected area

	productive area. Extensive areas covered with trees and shrubs. Dense stand of grasses along the periphery of the area. Growth of water hyacinth (*Eichorrnea* sp.) extensive. Large numbers of waterfowl.	by drought. Stretches of shallow water still present. Large numbers of waders and water birds present. Large sized fishes floating on water-surface. In some areas vegetation was decaying. Terrestrial birds like bee eaters, drongo, starlings, kites, vultures sighted.
Chakwa Chakwi, Jal Bihar and Cheetal Van	More number of trees and bushes. Area where cranes and mammals were found. Least disturbed by vehicles , tourists. Being wooded, prey birds were more frequently sighted.	Only Ca 10% of the area with shallow water (Ca 0.25 m).
Mound plantation and Hans Sarovar	Like Jatoli Canal, this area also supported high density of waterfowl. Trees along borders of the area supported nesting of egrets, storks, etc.	Shallow water (< 0.25 m) with some vegetation supporting ducks which are feeding wader-like. Rest of the area dry. Grazing of cattle in shallow water area. Large sized ducks like Geese, Gadwall (*A. strepera*) in plenty.
Kikar van	Woodland, supporting *Acacia* sp. Perching birds (e.g. Shrikes, Woodpeckers, bulbuls etc.) sighted.	Area completely dry. Perching birds (e.g. Robins, warblers) sighted.
Kraunch Sagar	Water is deep (= 1.5 m). Less floating vegetation. Less number of trees. Large numbers of waterfowl.	Cattle grazing. Major part of the area dry. Only Barheaded Goose (*Anser indicus*) and Greylag Geese (*Anser anser*) in large numbers.

Table 2

Four agents of disturbance to the waterfowl and their relative importance in the Ghana Bird Sanctuary during the 1979 drought (n = 20, each lasting 20 mts)

Agents of disturbance	Frequency of disturbance (%)	X^2 at 1 d.f.
Birds-of-prey	37.93	P > 0.05
Grazers	34.44	
Tourists	24.13	P > 0.05
Herdsmen	3.44	P < 0.05

Methods

The sanctuary was surveyed on foot during each visit. Records on species richness, density estimates, general distribution patterns and behaviour were made. These records were compared with our earlier data from observations taken during the months: January to March, prior to the drought.

Field glasses of 7 × 50, 8 × 30 and a zoom 7-15 × 35 were used for observing. The villagers and local Forest officials were interviewed for the details of land use and developments that had occurred in the sanctuary prior to— and after the drought.

Results and Discussion

None of the resident birds (e.g. *Podiceps ruficollis, Fulica atra* etc.) were found nesting in the sanctuary area. Absence of water during the breeding season (i.e. in monsoon) did not enable birds to breed for lack of food and shelter, an effect also reported by Hunduc and Statny (1970) in pond littoral ecosystems. Almost all parts of the sanctuary were reduced to dry land, except Jatoli Canal and part of the Baklaya-II area (Fig. 2). This reduction in the total surface water area, led to the mass immigration of resident birds into

the neighbouring states: Punjab (72 to 76 Lat. and 28 to 38 Long.), Haryana (between 75 to 80 Lat. and 30 to 32 Long.), Uttar Pradesh (between 75 to 80 Lat. and 30 to 32 Long.) and other states of North India. A number of newspaper reports on the immigration of water birds appeared during the drought period.

Reduction in water level (Fig. 2) was followed by a reduction in the vegetated area (Table 1). Clearly, most of the water birds congregated in areas where water supported some vegetation. Reduction of the vegetated area was particularly detrimental to the teals that were seen always orienting to the edges of vegetation from January to March. In November, they were found in shallow water areas. A drop in the water level caused homogeneity or reduced hetrogeneity in the habitat. Hetrogeneity in the habitat is important for waterfowl production, as pointed out by Patterson (1974).

Lack of adequate landing and feeding sites resulted in a high degree of aggregation, which in turn led to competition for feeding sites. In the process many species of birds (e.g. coots, moorhens, etc.), probably abandoned the sanctuary and winter visitors arriving late did not settle down in the sanctuary (Villagers, pers. comm.).

From January to March, habitat types included bare shores, sparsely vegetated ridges and flats, densely vegetated areas interspersed with open patches, and pools of varying depth (Fig. 1) that caused zonation in the tank. The water bodies then supported submergent, emergent and floating vegetations. Such diversity in the physical structure of the ecosystem (Fig. 1) as pointed out by Smith (1977) is ecologically important in providing display perches, shelter and nest sites and suitable foraging areas. Schroeder *et al.* (1976) are of the view that heterogeneity permits local population-shifts of wildlife to more optimal niches.

During the drought, the sanctuary ecosystem was largely represented by fewer habitats—dry tracts, wet mud flats , swamp and shallow water (0.30 m) areas. These habitat alterations and/or reduction resulted in imbalances at trophic levels in the ecosystem. Drastic reduction in water level led to decrease in the number, both of individuals and species of water birds. More than 25 species were recorded in January-March, while not more than 15 species were sighted in November. The waterfowl numbers in November were reduced by more than one third to one fifth of the original populations. In contrast, decrease in water level increased shore space and bare mud flats which provided more settling space and resource suitable for waders. We sighted almost thrice the number of waders in November than during January to March.

The qualitative and quantitative changes in the avian community of the sanctuary resulted from changes at the lower trophic levels. According to Conwenhoven (1977), reduction of moisture level generally decreases the phosphorus supply and causes changes in chemical and physical processes in the soil. This, we believe, destroys settled plant communities. With the destruction of plant communities the primary producers and existence of organisms at higher trophic levels become endangered because of lack of utilisable energy in the ecosystem. Dead aquatic arthropods were often found on the ground; breeding of crustaceans was adversely affected; smaller fishes were trapped in deep holes and cavities; reptiles (e.g. *Natrix piscatum*) were confined to shallow water areas; larger fishes trapped in shallow waters were continuously splashing the waters—a behaviour not noticed in our earlier visits. The absence of pisicivorous birds: Little cormorant (*Phalacrocorax niger*); Large Cormorant (*Phalacrocorax carbo*); Indian Shag (*Phalacrocorax fuscicollis*); Darter (*Anhinga rufa*); Brahminy Kite (*Haliastur indus*); Pied Kingfisher (*Ceryle rudis*); Whitebreasted Kingfisher (*Hylcyon symrnensis*) and the Common Kingfisher (*Alcedo althis*) can be perhaps taken as an index of the fall in fish production. Apart from waders like Spotted Sandpiper (*Tringa glareola*), Redshank (*Tringa totanus*), Common Sandpiper (*Tringa hypoleucos*), Little Ringed Plover (*Charadrius dubius*). Little Stint (*Calidris minutus*) etc., mynas of species of *Acridotheres* and *Sturnus* and parakeets dominated the drought-hit ecosystem. There was a visible inappropriate distribution of birds at various trophic levels. A sudden increase at one level and a steep fall at another would lead to a reduction in the working efficiency of the whole ecosystem.

The drought favoured euryecious land-birds like the mynas. Large flocks of more than 50 birds were seen actively feeding in areas where during January to March, water birds were sighted. The presence of babblers and shrikes that prefer scrub was pronounced in November than in January to March, indicating a preponderence of dry tract.

Under normal conditions (i.e. January to March) birds were observed feeding in a characteristic manner, which appeared changed during the drought. For instance, the shoveller (*Anas cylpeata*) with spatulate bill half immersed in water, strained the food down its mouth, during January to March. But in November, it was found feeding with its head fully immersed. Blue Winged Teals (*Anas querquedula*) were found usually feeding by dabbing in deep (> 1 m) Waters in January to March. After the drought, they scooped out food from squelchy mud flats. Many ducks, viz. Gadwall (*Anas strepera*), Mallard (*Anas platyrhynchos*), Wigeon (*Anas penelope*), Pintail (*Anas acuta*), etc. fed in a manner, typical of waders. Such changes in feeding habits may lead to suboptimal utilization of resources in these birds.

Another interesting visible change was the crowding of different species of water birds.

Flocks of different species which were widely spaced and moved within its own group in January to March, seemed all broken-up. Birds in March tended to intermingle and a mixed species crowd was evident. This was primarily due to the reduced water habitats.

Drought conditions indirectly affected birds by making them more prone to attack by predatory birds, particularly Osprey (*Pandion haliaetus*). The increased area of dry tracts decreased the foraging zones of prey birds, therefore, their hunting was more felt by water birds after the drought.

The extent to which birds were affected by birds-of-prey cattle, and human beings is shown in Table 2. The few pools of water were the refuges of grazing cattle on account of the grass and water availability. The grazing cattle and the herdsmen controlling the cattle were disturbing factors for these birds. Owing to these disturbances, splitting and coalescing in flocks was more frequent. Further, it may be added that the predation avoidance strategy in these water birds seemed ill-defined during November, 1979. Thus, repeated droughts may have drastic impact on birds, particularly on those, which are of high conservation value. However, infrequent occurrence may be favourable (see Ali 1979).

Suggestions

Selected parts of the sanctuary can be deepened so that in case of drought, at least in few pockets of water will be available. A few borewells from which water can be pumped out without disturbing the birds may be useful.

During the drought most of the vegetation had decayed and dried. A collection of aquatic plants should be maintained in the sanctuary to supplement the natural vegetation at such times.

A lot of felling was taking place in the sanctuary. Needless to say, this has to be regulated.

At least one productive area like the Jatoli Canal, for example, must be kept free from tourists. Only research workers should be given access to such areas.

Grazing must be regulated as both the cattle and herdsmen were found to be disturbing agents.

Acknowledgement

Authors are thankful to Prof. K.K. Neelakantan (President, Kerala Natural History Society, Trivandrum) for commenting on an earlier draft of the manuscript.

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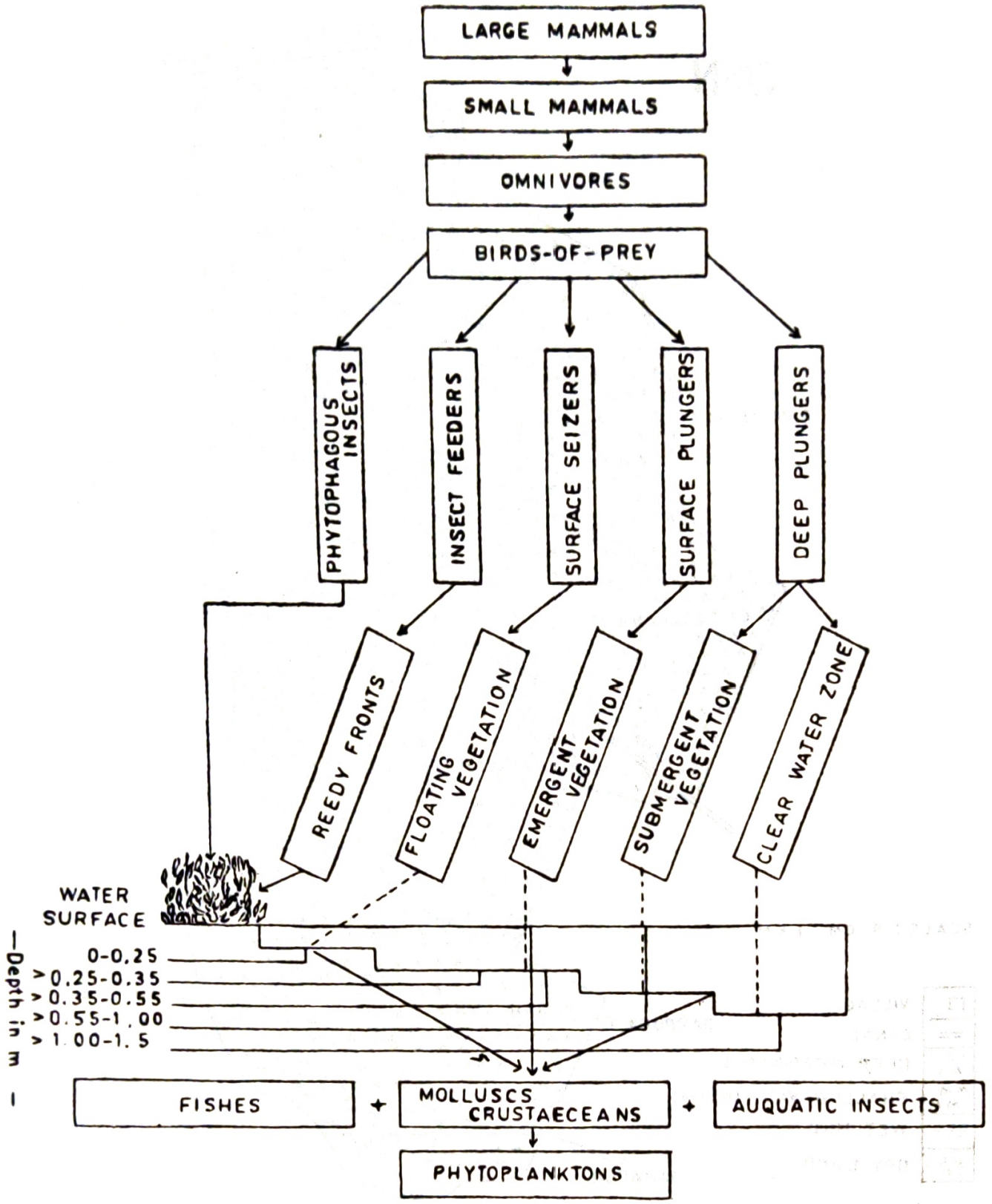

FIG. 1. Diagramatic representation of a part of the food web in Ghana Bird Sanctuary.

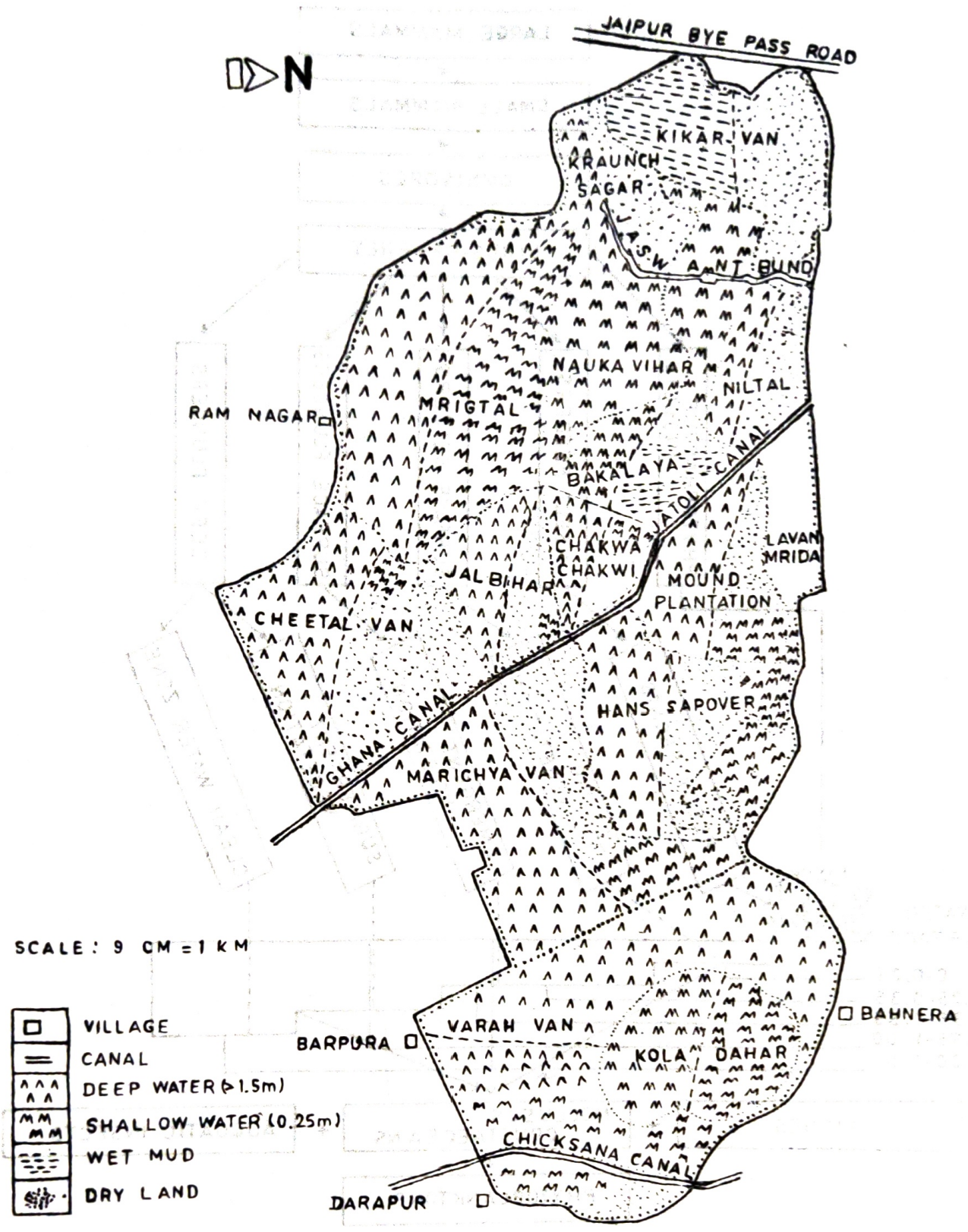

FIG. 2 Map of Ghana Bird Sanctuary depicting levels of water before (bold hatchings) and after (light hatchings) the 1979 drought

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Mahseer in Danger, Needs Protection

C.V. KULKARNI

Mahseer, the King of Indian rivers is, no doubt, in danger and needs protection of Government and the intelligentia especially the lovers of nature and out-door life. With the present restrictions on Shikar and almost a total ban on shooting in some places, angling has been one of the few out-door sports left open to enthusiasts of such lifes. Mr. Raizada has recently given in 'Cheetal' (1981) a depressing, though realistic a picture of the status of Mahseer in India and its present plight, in his article "The mighty Mahseer—Problems and Prospects of Culture and Propogation". The fish was at one time, the anglers' delight and pride throughout the Indian subcontinent and many a sportsmen enjoyed their holidays and spare time going into tree-clad river-sides trying their skill, luring these denizens (mahseers) of the crystal clear waters, forgetting all other woes and worries of the common place life. Those days have unfortunately disappeared in oblivion as the fish is virtually non-existent in many many of our streams and rivers. Historical facts, nomenclatorial changes and other details furnished by Raizada hardly deserve any repetition but the main task that faces us is how to mend matters to save this world famous fish tribe before it is too late. Collation of information and ideas is an essential prerequisite for this effort and hence this article.

The sport fisherman of the past have done tremendous service to the nation and to the fishery biologists by observing the behaviour of these fishes and recording them in their books, Thomas ('Rod in India') being an excellent example. But they had their limitations, as they could not divert very much from their pastime. Professional biologists have, therefore, to fill in the gaps and varify the observations, but unfortunately many of them have been restricting themselves to laboratory observations, though some creditable work has, no doubt, been accomplished (Desai, 1970), Kulkarni (1971) and Pathani (1979). Nevertheless, most scientists had no opportunity to see the devastation of the mahseer population with their own eyes.

Mahseer Project

"Mahseer Project" is indeed extremely essential and, as I understand from the article in "Cheetal", it is yet to start in the state of Sikkim. Conditions regarding wanton destruction of mahseer are certainly dismal and their numders are dangerously receding; however, there is a silver lining to the cloud. A similar project with reference to the Deccan mahseer (*Tor khudree*) was envisaged by Shri S. Moolgokar of TELCO 12 years ago and work started by the help of biologists in July 1970. The operation involved observations on the breeding habits, artificial propagation and rehabilitation of *Tor khudree* in the hydel lakes of Tata

Electric Co. at Lonavala, Dist. Pune (Maharashtra). This was the first attempt to study biology of Mahseer by a biologist in the field, though Hamidkhan (1939)and Nazir Ahmad (1948) attempted it on a small scale. After some trial and error, ripe males and females were stripped, eggs fertilized, hatched and about 14,000 fry and fingerlings raised by this artificial method for the first time, in 1970 (Kulkarni 1971) and the work continued.

Awareness of the problem commenced gaining ground on a national level with the recommendation of the National Commission of Agriculture (1976) recommending that in view of the decline of Mahseer fishery, biological and ecological investigations on different species of Mahseer be taken up. As a result of this the CSIR and UGC sponsored studies on the Biology and Ecology of Kumaon Mahseer and part of the work is recently published (Pathani 1982) and elsewhere. Shri M.L. Mehta (Times of India 6-6-76) and Melvil DeMellow (Sunday Times of India, 19-7-81) have effectively championed the cause of Mahseer and exhorted mounting a 'save Mahseer' campaign.

Details of landing at Govindsagar given by Mr. Raizada indicate a distressing fall in the catches of mahseer from 63% to 10% of the total catch; though quantitatively in Mahseers alone, the decline was 33%. It is significant that this decline resulted in spite of much increased effort in later years. All anglers and Directors of fisheries in different states also agree unanimously that mahseer population is dwindling to an alarming extent. To encourage stocking of mahseer in commercial fisheries, role of mahseer in the reservoir fisheries has also been elucidated by the author (Kulkarni 1981).

Use of fish ladders to enable the mahseers to cross dams to reach their breeding grounds were tried in the past with notorious reputation and served no purpose. Proper investigations have, therefore, to be conducted first to ascertain the capacity of our mahseers to negotiate such ladders before they are recommended. There are some successful Mahseer Fish ladders on the Ganges at Hardwar.

Action Plan: Despite this situation very little action worth the name has been taken in the country except continuation of work on ***Tor khudree*** at Lonavala (Dist. Pune) on a small scale where suitable designs of hatchery and hatching procedures were evolved and fry and fingerlings were produced in lakhs, (Kulkarni & Ogele 1978) as stated below:-

1970	:	14,000	1971	:	76,500
1972	:	1,33,100	1973	:	2,34,200
1974	:	2,72,300	1975	:	2,20,800
1976	:	2,38,400	1977	:	4,16,000
1978	:	5,63,000	1979	:	5,75,000
1980	:	4,17,000	1981	:	4,92,000

Most of these eggs were hatched into fry and grown to fingerling stage and stocked into different lakes of the Tata Electric Co. Moreover, some of the states which required Mahseer fry were given the stocking material as gift, so as to rehabilitate the mahseer in the new waters. Wisdom of stocking *T. khudree* in the warm waters of Jammu can be testified only from future results, *T. khudree* also requiring 21 to 22°C of water temperature for spawning. But the quantity taken (10,000 fry) is too meagre to make a dent in the new surroundings. Karnataka Government which realised the ill effects of depletion of mahseer in the Kaveri river were supplied with a sizable number of 90,000 fry over a period three years. Mahseer being a highly adaptable genetic stock, it is expected to adapt itself to new waters. The aforesaid effort is, of course, an infinitesimally small measure of work as compared to the gigantic efforts required to rehabilitate different species of our mahseers all over the country. Only a certain technique has been standardised in these efforts.

Secondly with the deterioration of the natural habitat of mahseer on account of construction of numerous multi-purpose projects for irrigation, power and potable water supply which are essential for the developmental activities of our country, a compromise has to be struck by making compulsory, a provision of a suitable fish farm as an intrinsic part of the budget for every such project for adopting scientific methods of rehabilitating mahseer in different associate streams. This rehabilitation can be achieved by stocking these waters with fingerlings in the same manner as is done in the case of the famous Salmon in Western Europe and America. There, apart from fish ladders, salmon hatcheries are established near dams where ripe males and female salmon trying to migrate up stream for spawning are collected, stripped, eggs hatched and resultant fingerlings released downstream to go to the sea, grow and migrate back again to serve as a commercial fishery and also to spawn to raise the next generation. Whether it would be advantageous to collect ripe mahseers from the spawning grounds near the adjoining streams of joining the lakes and to strip them or to raise the brood fish in farms will depend on local conditions. Our experience at Lonavala indicates that mahseers do develop gonads in ponds but the number of eggs is small and not quite healthy. But the males are useful as a stand-by stock of milt in stripping operations in case only females are caught from the spawning grounds on any particular day.

Mahseer eggs (3 mm) being heavy, tough and taking long time (90 hours) to hatch are capable of withstanding long distance travel. One of the innovations developed at the Lonavala Mahseer Farm was the technique of air transport of fertilized eggs of mahseer. As a trial, two consignments of eggs were sent to Bangalore from Bombay airport which reached the destination with only 2% mortality. The method will enable transport of eggs from one station to

another in India, if not to any other country in the tropics and will enable propagation of mahseer wherever it is required.

Experiments on Tor Tor fingerlings brought from Narmada river (Hoshangabad, M.P.) conducted at Lonavala have indicated that the fish can be raised in farm ponds and can be bred by hypophysetion (induced breeding method) without much difficulty. Even hybridisation of *T. tor* and *T. khudree* has been successful and hybrid fingerlings can be used for stocking distant waters.

Establishment of special farms and hatcheries for Putitor mahseer is a good idea but enough observations have not so far been recorded on the breeding habits and spawning sites of putitor mahseer. Pathani (1979) has reported to have seen these in the Bhimtal Lake in the Kumaon hills which is an artificial habitat for mahseer. However, this information can be utilized after verification. So far hardly anybody has been studying the spawning behaviour of Mahseer in fluatile waters which is their natural habitat. No opinion can therefore be expressed on the imaginative design of mahseer farm for the Sikkim state. Such new ideas should be most welcome and one should only wish it good luck and bumper production of mahseer fry and fingerlings for propagation into different waters.

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Cheetal—Vol. 23, No. 4

Convocation Address at the Wildlife Institute of India, Dehra Dun

T.N. KHUSHOO

Secretary to the Governn ent of India, Department of Environment

Shri Tiwari, Shri Saharia, Officers of the Diploma Course in Wildlife Management, Distinguished Guests, Ladies and Gentlemen:

It is my privilege and pleasure to be here today at this renowned Institute, among its distinguished faculty and address the Convocation of the Officer-trainees of the Fourth Diploma Course in Wildlife Management. I look upon the trainees passing out today as the future custodians of the rich wildlife of our country.

Wildlife has been defined as the sum total of the animals and plants, excluding domesticated or captive animals and cultivated plants grown for human purposes. In this sense, our country is endowed with a particularly rich biological heritage, and our scriptures and epics are full of vivid and beautiful accounts of wildlife. So long as the human being was a simple-minded fruit and root gatherer, he looked upon nature with awe and respect and in fact, he worshipped it. But from the time he began to use his superior intelligence and understand nature, he became progressively self-centered, and in the process started disrespecting and destroying the natural environment. Today, he is attempting to dominate nature, shape the environment to suit himself and use everything around him in utter disregard for the natural scheme of interdependent ecological regimes.

The most serious threat to wildlife is posed by habitat destruction. Expanding agriculture, industry and urbanisation as also unavoidable defence needs, are the causes of this situation. Humankind's hunger for land remains insatiable and has led to progressive loss of vegetal cover. And today, in India, effective forest cover is hardly 12% as against 33% envisaged under our National Forest Policy Equally important are factors like over-exploitation of vegetation, uncontrolled grazing by livestock, lopping of trees, forest fires, introduction of exotics and consequent replacemnet of indigenous species of plants and animals, excessive use of synthetic pesticides and fungicides, and unabated international demands for some of the indigenous species such as skins of different animals, orchids, rhododendrons, etc.

Normally, soil is constantly generated and enriched when an ecosystem is left undisturbed, or even minimally disturbed. However, due to the loss of vegetal cover, there

is progressive loss of the valuable resource, the soil, due to erosion, together with all the attendant consequences like landslides and siltation. A major concurrent effect is the loss of yet another vital resource, namely water, which indeed is the lifestream of all biota. Sweet water is not only lost to the seas, but is also polluted to an alarming extent.

Basically, the destruction of wildlife is the result of human greed rather than genuine need; so much so, that today, almost all development has become synonymous with deforestation and desertification, and progress with pollution. This has happened even in India where we have a rich tradition of conservation of wildlife. In fact, the concept of "*Ahimsa paramo dharmah*" is, in a sense, more than anything else a conservation concept, inasmuch as it preaches non-violence not only against fellow human beings but also all forms of life. For instance, the story of *Bishnois* saving their tree wealth is still fresh in our minds. We also have the sacred groves which are never touched and are left undisturbed. In order to make conservation more effective, our ancestors gave a religious colour to this concept.

While soil erosion is perceptible, the erosion in our biological wealth, namely plants, animals and micro-organisms goes on unperceived. This is vary disastrous as one cannot foretell what species may be useful in future. In fact, the famous saying of our ancient physicians is that a useless plant has yet to be found. Besides, it is now realized that with extinction of one plant species, 10-30 others like insects, other plants and micro-organisms which in a balanced ecosystem are dependent on it in one way or the other, also become endangered and may be lost. According to some, concern for conservation is a "middle-class luxury". Mercifully the number of such persons is small and fortunately, of late, there has been a growing concern about the disastrous consequences of the past actions of human beings.. There is now a global resurgence of interest in conservation and wildlife is now looked upon as an important renewable resource. Conservation and wise management of wildlife must, therefore, receive due importance in our planning processes and economic development must be based on ecolcgical considerations. The guiding philosophy has, therefore, to be "development without destruction".

There are varying estimates of the loss of plant and animal species. In India, nearly 134 plant species are regarded as threatened. As against this, one mammalian and three bird species have become extinct and 71, 47 and 15 species of mammals, birds and reptiles respectively have been declared threatened. Furthermore, India is the centre of origin of nearly 117 species of economic plants whose land races and wild relatives are needed for their constant genetic upgrading in order to obtain higher yields. Most of these species fall in our tribal belts and these communities have with them a large reservoir of valuable genes of the crop plants as also of domesticated animals which have proved to be very hardy and resilient under conditions of stress. Many countries have drawn from this

distinctive gene pool existing in our country, for conferring hardiness and disease resistance to their crop species and domesticated animals. Obviously, on no account can we afford to let this gene pool dry up. The wildlife resource is intimately interwoven not only with forestry, agricultural, horticultural and fisheries resources, but also with the cognate physical ones. In fact, at the base of such a matrix, there is an intimate relationship between plants, animals, micro-organisms and physical resources.

Realising the importance of the wildlife resource and in order to prevent the gene erosion, our country has from time to time taken steps by way of enactment of various Wildlife Acts (1873, 1878, 1932 and 1933), setting up an Indian Board of Wildlife (1952), creation of Wildlife Parks and Sanctuaries, enactment of an All India Wildlife Protection Act (1972), becoming a party to the Convention on International Trade in Endangered Species of Fauna and Flora (CITES, 1976), launching a national component of the UNESCO's Man and the Biosphere Programme (MAB, 1971) and by starting conservation projects for individual endangered species like Hangul (1970), Lion (1972), Tiger (1973), Crocodiles (1974) and Brow-antlered Deer (1981). However, except for a gene sanctuary for citrus and pitcher plant both located in NE India, by and large, plants have been taken for granted and have been left out of consideration in any meaningful programme of wildlife conservation. The reason for concentrating on the protection of large mammalian wildlife is apparent. It is assumed that "if all is well with the apex, the base of the ecosystem is okay". In other words, if tiger is flourishing, then it is reasonable to assume that chital and other herbivorous prey are also flourishing and all plant life as also lesser forms of life are also flourishing. This approach, which is heavily slanted towards animals, stems from the fact that generally wildlife is taken to be synonymous only with animal life, although plants are the primary producers and are critical to the very existence of all life on the surface of our planet. One can hardly emphasise that a plantless earth may not support all forms of life. This imbalance needs to be corrected immediately and only then we can materially add to the efficiency of the programme of conservation of animal component of wildlife. Furthermore, while there is general appreciation for a minimum area demand for each species of mammals (like lion, tiger, rhino, etc.), there is no appreciation of the fact that plants, particularly forest tree species, also require a minimum area and population size for their long-term survival.

The measures referred to previously have helped in arresting the rate of depletion of many species of animals, particularly in the areas covered by National Parks and Sanctuaries, and in various project areas there has been a marked increase in the size of the populations of the endemic species.

So far, almost all the measures taken, have been preservation or protection-oriented and rightly so. But management of wildlife does not mean only propagation of a given species in a limited protected area. In addition, it requires the rehabilitation of the given species in still available habitats elsewhere, scientific management of such areas for their propagation, and a judicious cropping in the new areas after optimum population levels have been achieved. This goal of management cannot be achieved unless ecology, population genetics and ethology of individual species are studied in detail. Unfortunately, ecological studies on wildlife species which entail thorough field work have so far failed to attract the bulk of laboratory-oriented research scientists in India.

The studies on individual species should cover the whole gamut of parameters like:

i) Habitat: topography, flora, fauna, soil, geology, hydrology, meteorology, etc.

ii) Population structures, age and sex ratios, and population growth.

iii) Individual/herd behaviour, time budget.

iv) Intraspecific and interspecific competitions.

v) Foraging habits, local migration.

vi) Food, food cycles, food preferences, food consumption rate.

vii) Growth rate, longevity, disease.

viii) Prey and predator relationship.

ix) Breeding habits: sexual maturity, number of mates (monogamy, polygamy), dominance, breeding ratios (in a population), breeding success, etc. In case of plants the breeding system: self or cross pollinated, nature of incompatibility, mode of reproduction: asexual, sexual or apomictic; dispersal mechanisms, life form: annual, perennial.

In short, such studies should be aimed at an understanding of the genetic system of the species in question, or in other words, the mechanisms controlling the extent and nature of heredity and variation. Given on ecological niche, conservation of a particular species in time and space will be largely determined by its genetic evolutionary potential.

In India, such studies have been made on very few plant and animal species; in fact, wherever work has been done, not all these parameters have been covered. On the other hand, detailed and all-embracing studies have been conducted on Indian animals abroad where these have been introduced in recent years. Examples are: Cheetal (Hawaii, Texas), Black Buck (Texas) and Himalyan Tahr (New Zealand).

A lack of foregoing studies accounts for inadequate inventorization, which is essential for evolving a long-term strategy, such as, finding a suitable "Second Home" for animals like Gir Lion and Kaziranga Rhino, whose populations have crossed the maximum carrying capacity limits of their respective conservation areas. However, such a strategy cannot be based only on individual species or individual communities, but most importantly also on an ecosystem approach, because otherwise there is the risk of genetic drift. It is also important, as indicated above, to crop some populations and to control others which have the potentiality to increase their numbers and become a menace.

In recent years, there has been an increasing realisation that wildlife conservation is a total concept involving animals, plants, micro-organisms and soil as also other physical elements of environment, in which they live and on which they depend. In this context, it is indeed gratifying to note that the number of National Parks and Sanctuaries has risen from a mere 33 in 1952 to a total of 221 by the end of December 1980, covering 2.3% of the total geographical area and 10% of total forest area of the country. Furthermore, starting in 1970 with a certificate course of 6½ months duration in the Indian Forest College and later a Diploma Course of 10½ months as well as a short term orientation course for DFOs under a fullfledged Directorate of Wildlife Research and Education, the Government of India have just accorded their approval for converting the present set-up into a Wildlife Institute of India. It shows the abiding interest of, as also the importance attached by the Government of India to the wildlife heritage. This is also a reflection of the dedicated and painstaking work that has gone on during the last decade at this Institute. All those concerned with this effort deserve hearty congratulations. However, to me, as a student of science, the most important element is the extent and nature of science that has gone into the formulation and execution of the programme. The Institute will need a tremendous input of science to sustain and fulfil its role and goal and to attain the aims and objectives set before it. Having had forestry traditions in my family, I know for certain, the postof a Game Warden, in most States, usually used to go to the most inefficient forest officer. This cannot be allowed to happen any more, because wildlife conservation is no longer a routine forest activity for recreational, aesthetics and better quality of life. It is a multidisciplinary area of science including among other subjects, intimate knowledge of autecology, synecology and population genetics. Very recent work has proven the use of even gonad transfers, genetic engineering and tissue and organ culture techniques. Unfortunately, we tend to ignore or underplay the scientific component in conservation programmes. Obviously, if wlldlife has to remain a part of the forestry system, the most enlightened officers with a strong scientific bias will have to be drafted for this work.

This programme has also socio-economic dimension, like resource practices of societies living within or in close proximity of the forest or wildlife areas, and these have indeed a

great bearing on conservation strategy. It is indeed heartening to find from the report of the Director that this aspect has been taken note of in the curriculum planning of the Wildlife Management Courses and that a case study in 'Human Dimensions in Wildlife Management' has been undertaken.

The path of a conservationist in India is not a smooth one, there are considerable obstacles before conservation can become an established social practice in India. Shortsightedness and taking to the path of least resistance often involving superficial approach is not a correct policy. Rather, solutions have to be found out by facing facts and making indepth studies. Mere legal sanctions will not help. For success, conservation of wildlife has to evoke a mass-awakening and mass-support as is the case in the Western World. While wildlife is a part of environment *per se* and Government of India will do whatever it can, it has to become a movement, a people's movement. A realization among the people of the importance of environment has to be built up meticulously, indicating clearly what it means to the present generation and, more importantly, to the generations to follow. Therefore, there is an urgent need for education to spread and enhance people's appreciation and awareness of the values of wildlife, not only as something which they can enjoy, but also something they have a direct responsibility for.

I have no doubt the trained officers from this Institute will constantly address themselves to these problems. They have a distinctive role to play. Today, our urgent need is for Environmental Managers, who are not mere managers of animals and game, but managers of ecosystems who are to be well versed with not only ecology, population genetics and forestry but also flora, fauna, soil, geology, meteorology, socio-economics and all other connected subjects. Thus, there is a need for an integrated approach for management and conservation of wildlife. This is only possible if we have accurate, scientifically documented, baseline data on biological wealth as also all the associated physical aspects.

May I heartily congratulate all the officers for the successful completion of their training and wish everyone of them a successful career on the eve of their embarking on a very important, but a challenging and a difficult career.

I thank Shri Tiwari and Shri Saharia for giving me this opportunity to share some thoughts with the officers who have a vital role to play in management and conservation of living resources of our country.

Thank you.

30.6.82

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Further Wild Encounters in Darjeeling Himalaya

Rathin Mukerjee, Suvendu Sekhar Saha and Ranjit Kumar Ghosh

Once again we stepped into the enchanting mountain wilderness of the Darjeeling Himalaya. But this time during the winter of the year 1975. By the end of February that year, we established our base camp at Ghoombhanjang. For a couple of days we scanned through our old favourite locations for any novel findings in and around the camp. One afternoon, when it was all drab and chilly with an overcast sky in addition to the usual veil of fog and mist typical to the area, above Youth Hostel in the Cryptomeria grove, repeated barks of Barking Deer broke the monotonous orchestra of the Cicada and the trickling bell of flowing water of a small stream that ran down the rocks and boulders nearby. Through the concave slope on the hillside amidst the grove the floor of which was littered with shed needles forming a thick soft carpet and allowing a very few species of plants to grow underneath, of which the species of branching fern was successful to grow, a pair of Barking Deer, visibly shaken by the chilly weather, drove past before us with their skillful balancing gait along the narrow undulating sloping track. Before they were out of our sight, amidst the prevailing darkness that synchronized with the moment of sunset so suddenly happened beyond the western slope of the spur of the Ghoom range, left us some what bewildered. And at the same moment, to our surprise a flock of 6 or 7 ground birds, larger than the Kalij Pheasant, walked through the cover of ferns so suddenly and quickly to keep us spellbound. They were no other than the Eared Pheasant. As soon as we could regain our senses and reconned the purposes of our mission and take any action the birds reacted faster and took cover out of sight. Just before our unbelieving eyes the birds disappeared and could not be found again despite our frantic search following on subsequent days and also on our return camp at the end of this mission. Eared Pheasant is supposed to be found on the northern face of the Himalayas, far away from Darjeeling not within about 30 or 40 km and also at much higher altitudinal range. This could have been another novelty which we missed in having a concrete evidence of having a bird in hand rather than in bush. However, we had another prize waiting for us on the return trip to this camp which was a specimen of giant flying squirrel eventually described later as a new subspecies, namely, ***Petaurista magnificus hodgsoni*** (Ghose and Saha, 1981). J. Bombay nat. Hist. Soc. Vol. 78 (2).

We had a camp at Selimbong on the slope of the Little Rangeet Valley. The forest all around here was of tropical montane type with planted groves of Cryptomaria. The forest deparment had a nice nursery bed for their plantations near the bungalow. In the

jungle, animals like Sambar, Barking Deer, Flying Squirrel, Himalayan Hoary-bellied Squirrel, Himalayan Stripped Squirrel were coomnly met witn. An interesting species that we have bagged in this camp was a Mole. The animal was stampeded in the dark when we were running hectically to and fro while trailing after a hare that played hide and seek with us all that night The stampeded animal was discovered next morning in the under growth close to the bungalow. But here we arrived much later, actually after concluding at Sandakphu.

As on our previous encounter, the main object of the mission was to carry out field explorations on logomorphs, we advanced to further higher-towards Sandakphu again. On the way, we set a camp at Tonglu right on the Singalila Ridge crest that extends from Manebhanjang in the south towards north into Sikkim. No sooner did we arrive at the mid day, flakes of snow suddenly started to come down from the heaven. And within a short, the entire surface of land, from higher regions of Sandakphu down to certain height much below Tonglu, got covered with purest white snow of a few inches thick layer. It was so soothing in that dim glare under heavily overcast ashy grey sky. Our joy and excitement kept us playful until the blanket of darkness fell suddenly. Moreover, we were tired and exhausted for loss of much of our energy in venturing out in the snow.

Next morning, when the frozen surroundings were glittering with the reflections on snow, to our amazement, we noticed many trails of hares all around. In the higher altitudes of Darjeeling Himalaya, the Wooly Hare is supposed to occur and we intended to bag specimens of this species. A frantic search was made through out Tonglu. But we were rewarded only after three days. In a sorty for collection in early hours of the night, we spoted a hare with our searching headlights, after waiting patiently for hours together. The hopping hare was downed in no time by a bang from our shotgun. During our stay at Tonglu, Barking Deer in teams of several individuals or singly were seen at different hours of the day. Search for Pika was not fruitful here. But on one occasion a Himalayan Black Bear was confronted. And on a mid day, a pack of Wild Dogs composed of nine adults and a young, ran past the medow lying in the second terrace below Tonglu. This marauding pack of canines were probably the devils that frequently took toll of livestock over a wide area on the ridge and were the possible heroes of the killing of a horse on the last occasion of our visit to Sandakphu.

From Tonglu we set out for our next camp at Sandakphu. The latest snowfall that covered the entire area under a thick layer of snow, meanwhile frozen into rock hard ice. It was very difficult to manoeuvre while walking on the icy ground. Amidst the frozen surroundings many species of birds were seen. Those noted by us in particulars were beautiful

Blue Magpie, Nutcracker, Bullfinch, Snow Finch, Laughing Thrush, White-collered Thrush, Redstart, Nepal Yellow-rumped Sunbird, Fire-backed Sunbird, and a pair of Bearded Vultures. Among the small mammals, Yellow-throated Marten, Eha's Rat, Darjeeling Spiny-backed Rat, Sikkim Vole, Darjeeling Tiny Shrew were commonly met with. We looked for the Pika in their usual abodes, which we had located in our earlier encounter. But this time once again we could not trace any sign of them for couple of days. Probably because of the entire ground surface being covered under a thick layer of snow, the animals minimized their activities on the surface if not totally suspended. When we started to build up a notion of their hybernation in the winter, to our surprize a Pika was found to be barking in the early morning sun at about eight o'clock, when the sun shone after a couple of days of heavy snow and frost. The Pikas made elaborate tunnels like that in the soil, through the layer of snow. When the snow started melting after the improvement of weather and sun-shine, the tunnel system became exposed partly to be easily detected. As usual the Pika we spotted withdrew instantly into its tunnel system at our approach. But after patient waiting for about half an hour ambushing near the tunnel mouth we could manage to bag that Pika. And likewise we bagged a few more of them.

During our stay at Sandakphu on this occasion, an animal trapper came to our camp with his booty of sundry animal specimens of which a ten feet long King Cobra was very interesting. That wriggling monster was still active inside the cage even in that cold weather. The trapper had with him number of pelts of several important mammals and birds. They were Red Panda, Yellow-throated Matten, Jackal, Kalij Pheasant and other birds said to be procured from the village down below Sandakphu but across the Indo-Nepal border in the territory of Nepal.

Time to leave Sandokphu gradually approched. A weeks stay in that beautiful country passed away so quickly amidst our very busy and laborious field work to leave us in a pensive mood. And finally we left Sandakphu. As our jeep started to move we had our final look behind to see beautiful birds in flocks busy feeding on the ripe fruits of wild rose and the pair of Bearded Vulture soaring over the valley and occasionally coming down to perch on a particular spot on the cliff probably initiating their act of nest building to raise their offspinings and continue their progeny.

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The Story of Khairi

(Not of a mere tigress)

S.R. CHOUDHURY, I.F.S.

Clouds were pouring down the Grand Trunk road in U.P. state and onward the old Jagannath road through Bengal, Bihar and Orissa. The latter led to my home town. It was under extensive improvement as a National Highway—NH 5. Many trucks stood in the slush of incessant rain. I had to be careful on the wheels. We were driving back to my state in July 1973, I and my fair cousin Nihar.

I had completed a four years term in the Forest Research Institute at Dehra Dun. In that I had organised the first ever education in scientific wildlife conservation in India and trained five batches of in service wildlifers. Nihar was my most devoted coworker since 1967.

Three days by car, across four states. 1500 km to our home town. Plenty of time. We talked lots, of our past experience and about our future work. I was to head the Project Tiger in my state, Orissa.

The incomparable tiger land of the Similipal hills, in North Orissa, had been identified as one of the nine tiger reserves in India. Two more have been added subsequently. I had prepared the preliminary management plans for Similipal and Corbett tiger reserves. We were coming back to implement the project in Similipal.

The project is a national trust with international participation to save the future of the Indian tiger. The historical home of this magnificent great cat in my country got visibly depleted of its famous tigers, eversince the 50's when the price of the precious tiger skin started mounting leaps and bounds in the world market. Many many tigers met painful deaths in the surreptitious poisoning for their pelts. The residual living ones could never sense the reason of such deaths. They could not, therefore, become alert to the silent poisoning like they were to loud shooting. More than one unsuspecting tigers could be killed even by a single poisoned kill. And, that very potently destructive method was alarmingly wiping away the wild tigers.

By early 70's the serious decline in the Indian tigers was all too apparent. The first countrywide tiger census was, therefore, organised in 1972. It was conducted with a simple device named Tiger-tracer invented by me in 1970. The Tiger-tracer is a thin, transparent rectangular glass sheet fitted to an ordinary 20 x 30 cm photo frame. Place it over tiger's footprint. The pugmark is clearly seen through the glass. The outlines of the pugmark is then traced with a fountain pen correctly on the glass face. Place a white paper over this

tracing on the glass and hold it against light. The tracing in seen through the paper. It is easy then to copy the pugmark exactly on that paper. The ink on the glass face is, thereafter, wiped clean and the Tiger-tracer is ready for the next. The exact tracings of the footprints of soft pawed cats are distinctive individually. Pugmarks of no two tigers are identical. Each tiger can hence be identified and counted by its footprints.

The 1972 census participants looked for the left hind pugmarks of wild tigers in disciplined search during the scheduled week, simultaneously all over the country. The paper tracings of tiger pugmarks collected by them were pooled regionally and compared to identify different tigers. The final estimate was 1827 free living tigers then in the whole of India. They were admittedly two few, and distressingly still on the decline. Many felt concerned in the national and some international forums. In that concern crystallised the Project Tiger.

The project contemplates strengthening of protection and intensification of conservation in the eleven tiger reserves located purposefully in different life systems and diverse natural habitats. Each tiger reserve has a core area surrounded by its buffer zone. In Similipal, the core area covers 303 sq km and its buffer zone 2347 sq km, a total of 2750 sq km. The tiger is rigidly protected and looked after scientifically both in the core and in the buffer, and alongwith the tiger are necessarily conserved also the plant and animal lives of the ecological systems which harbour and sustain it.

The principle in the core area is monumental preservation with no human interference. The objective in the buffer zone is integrated conservation which has to be rationalised with the ecological constraints of the ecosystems and the regulated demands of human use. In practice, besides protection it is a process of pragmatic study and probing research in ever widening horizon to progressively wisen conservation and refine its techniques of manngement. Tiger Reserves are the pilots of such practice. Study and research in living animals is a part of that practice.

On our way back home, talking about research Nihar suggested that with my future work on the tiger in Similipal it would be worthwhile to include the study of a living tiger, through its life. A good suggestion indeed. Given reasonable freedom, the basic properties in the innate behaviours of an individual would not change irrespective of the shifting of its environs. Measured objectively, those could be projected to the free ranging tigers in nature, to understand them better. I wondered if Nihar's proposal could take any practical shape. And I wondered too, how much would it be worth in wisening me and the project after my forty years experience with the wild tigers. I thought I knew quite something about the tiger. I am being wisened by Khairi. She is a tigress, one of our family members living free without cage or chain, dope or charm. She was brought to us, a tender two months old cub, on October 5, 1974. Two days earlier she had been robbed from her mother by twelve

Khadias of an autochthonal tribe in Similpal. They had, as usual, gone to collect resin, honey, wax and their tuberous underground food in the upper reaches of river Khairi. Suddenly that afternoon they almost stumbled on a tigress lying near her cave. Nestled to her belly was her tender little cub.

Scared out of their wits the Khadias condensed into a tight group and shouted together to gather their courage. It helped them though. The tigress stood up, took a good look and pondered a wee moment to size their strength. She then slowly walked away instead of charging towards the men, because they were too many. She would not demonstrate against so many shouting at her. She would resort rather to the ruse of 'broken wing response' of the bird who draws the predator away from its young ones in the nest to its ownself, on the wing, suddenly dropping to the ground, feigning as if its wing were broken. The tigress hoped that while she kept the attention of the human beings drawn to her own receding figure, her cub would slip unnoticed into the safety of the cave. The cub did try. But, before she could get in, two of those Khadias, emboldened by what they thought was the sulking of the tigress, rushed to catch the cub at the cave mouth. They caught wrapping her in a cloth. So sudden and so very frightening was her capture that the little thing was struck dumb. Had she cried to the hearing of her mother, the tigress would have rushed back roaring to rescue. Such a thing did happen during a field investigation two years later, elsewhere in Similipal. Our project staff had to beat a hasty retreat under the cover of a blank gun fire.

By sunset the Khadias were back in their hamlet at village Jenabil in central Similipal, the cloth covered cub secured mum in their resin basket. Next morning they started with that basket for Jashipur situated on NH 6, 300 km by road on either side from Calcutta the metropolis on its north and Bhubaneswar my state capital to the south. We had been staying there in the forest rest house. Jashipur is over 50 km on foot from Jenabil. With an overnight stay on their way they handed over the cub to the Forest Range Officer, the following afternoon. An hour later she was brought in the project jeep to the forest rest house.

After the jeep settled silent in the portico, I and Nihar came out to have a look at the cub. A curious crowd craned behind the jeep. I lifted the back flap to find on the left side seat, a thin little cub, the size of a large tom cat constricted at the Range Office with a chain round her neck, round and round her shoulder followed by many rounds of a thick rope over the whole length of her body. Her forelimbs were free. She was lying on her belly. When I lifted the back flap, and she saw us all, she bared her halfgrown milk fangs and snarled the mimic of the hiss of a large snake. And she emphasised her defence by lashing her wide open claws. She was born with such defensive display. How else would she have any

chance to survive in the den when her mother was out prowling for the kill and any lesser predator chose to peep in ?

I put the flap down and asked the people to move away. Nihar stood near the left front door. As I lifted the back flap again, I throated the triplets of 'prusten' the vocal greeting of the tiger corresponding to the purring of the house cat. It hears similar to the soft clearing of the throat, like unh-unh-unh. The cub appoared to recall her mental imprint of love and care in what heard like her mother's voice imitated by me. She remained silent and impossible, her eyes lifted in my direction, her ears pricked towards my call. And then with my third 'prusten' she suddenly raiscd her face and looking into my eyes responded with soft, sweet, 'unh-unh-unh". Her happiness was apparent in her look, and voice. And while expressing it in the tiger way she tried to claw forward towards me. I lifted her to my chest and putting her neck on mine I squeezed her an intimate hug of love and affection—chain, rope and all. And then, after taking out the chain and the rope I held her in my lap. She turned, and putting her forepaws on to my shoulders pulled up pressing her lips under my chin. She clung to me with her claws while I took her face in my hands brushed my cheeks and lips against her and talked to her in her language, and tenderly too in my own. I did get slightly clawed, but I held on till she finally relaxed and I could feel the confidence which she reposed in me, her new found parent.

After a while I put her back in the jeep. A reassured little thing, she did what any universal child does – curious to know—sniffed here, sniffed there, all over the back space first and then jumped across the back rest to explore, again with her nose, the front seats. She smelt the gear levers and the steering which she addedly checked in her jaws. She then turned straight to Nihar standing at open left door. I moved round closer to see. Nihar was holding the cub nestled sung in her lap. The cub's eyes dropped while her foster mother voiced softly the lullaby, saying how happy she was to get that little tigress as her daughter—her dream come true. The cub was named after the river near which she had been found.

When Khairi looked drowsy, Nihar folded the back rest and put her on it. The cub slid down its rear edge and placing her back on the lean of the mudguard stretched her hind legs on the folded back rest. Before closing her eyes she spread a benign look at everybody back again at the jeep to see her. We closed the doors and the flaps to let her sleep. She had found the haven of love again after fifty hours of traumatic destitution. Within a couple of minutes we heard her soft snoring.

Two hours later she called in gentle cooing from the driving side. I went round and opened the door. Little Khairi was standing under the steering. She looked at me and

prustened. I took her to the dining room. Nihar was sitting on the floor near the dining table. I put the cub in her lap.

Nihar hugged her and fingered through her fur. The cub started licking her foster mother all over her saree, hands and face. While watching that intimate moment I was amazed, how soon it happened, the mutual mingling of their love through touch. In giving her love to her new found ma, little Khairi was feeling assured with her tongue. Nihar strengthened it in the warmth of her lap and the caress of her fingers. In that elaborate application of her tongue on Nihar the cub was also deepening the olfactory imprint of her foster mother's microdistinctive body smell. All animals with ultrasensitive nose do so. Khairi has been repeatedly confirming ever since, that contrary to general belief the tiger does have such a sharp nose. I had such wrong notion too, before the cub started proving us the truth. This truth makes considerable difference in the ecology of the tiger. A tiger who can smell his prey freezing in the bush and take it by surprise will have much higher survival success than any open range predator who chases mainly by its eyes, for example the cheeta, a pride of lions or a pack of wolves or wild dogs. The tiger survives in dense woodland mainly because of its nose. How much simpler does it not become now to understand the evolution of this largest of all cats, the tiger in the dense woodland.

Little Khairi after she had finished with her tongue, rolled out of Nihar's lap and lay belly up, on the floor. In the grown ups of her tribe it communicates acceptance of dominance, seeking protection, usually by a female to a male. Little Khairi lay belly up in blissful abandon to the love and care of her new found human mother. Nihar scratched the cub's belly, and that was something which Khairi really enjoyed.

The ritual over, the mini tigress went sniffing round the room in similar manner she had done two hours earlier in the jeep. She then showed off her tricks in scaling up and leaping down the furnitures and lastly my book case behind which she took cover to ambush her ma. Nihar saw and whirled round to escape. The little tigress came out in hot pursuit. They ran, Khairi chasing Nihar, seven times round the dining table. In the end, Nihar turned abruptly and squatted down saying that she was out, could run no more with that little tigress. Khairi grabbed her open arm, in a happy hug, like the victor shaking hands with the vanquished. And then, she slunk to the floor, belly up. Nihar scratched the cub's tummy tenderly and fondlingly fingered through he ruff. Khairi's happiness rippled through her body. Would anyone believe it of a wild tiger cub who had, barely two hours earlier bared her canines and her claws, snarling to shoo us away ?

A little later I drew the chairs out a bit and put Khairi on the dining table. The cub walked round its top and then jumped down to check the chairs. She finally dropped to the floor and looked under the table. When I saw her coming out I induced her to catch

me, by turning my back on the run. She took the hint and came chasing me. But unlike with Nihar, she cut across under the table in the first round itself and caught me redhanded. No chance. The cub had used her cat's head in unerring strategy after having seen its layout under the table.

When the play was over, I told Nihar to change her saree and put it in folds under her bed. That playful cub had had no food for more than two days. She had not accepted milk in spoon, nor in the feeding bottle. In our third attempt I held her tight to my chest while Nihar tried to force feed. It ended with many scratches on my shoulders, only a few gulps and much spilling of the milk. We let her be for the night. She went into the dark underside of Nihar's bed, sniffed the saree and lay on its folds. After a quick dinner Nihar too went to bed. I stayed back and wrote the diary. At midnight before getting into my bed I looked under Nihar's bed. The cub was as asleep on her ma's saree. So was Nihar on her bed.

One hour later I was awakened by the repeated cooing of the cub. I switched the flash light on and saw. Khairi was standing near Nihar's bed, her sweet little face lifted to the mosquito curtain, waking her ma to take her in. Nihar lifted the net and helped Khairi to get in by her side. They were soon fast asleep, the tiger cub snuggled to her human mother, in same bed. I put the light off and rolled back, cherishing the fond feeling in what I saw.

Much water has flown through, since, in river Khairi—six eventful years. Little Khairi weighed on the day following her arrival, only 6.2 kg and was 88 cm long, tip of nose to tip of tail round her back line. She is now a full grown adult weighing nearly 200 kg and measuring 273 cm round the curve, and the stands 91 cm at her shoulder. With a rather short tail and a long body, she is a large sized famale of the race of the big Similipal tigers. She has as large a heart too of love and fellow feeling as is wont with the immense strength and the supreme self confidence of a super predator.

The very next day after her adoption into our family she made friends with Blackie, our pet dog, also a female. Soon they became great chums, so much so that Blackie had to be taken wheresoever Khairi went with us, excepting when she was expecting to lay her first litter. She dropped her only pup on February 1, 1975. We were then out in camp. Next evening when we drove in we heard Blackie crying impatiently. She had not allowed anyone to come near her pup. On hearing her I knew that she had recognised our jeep by its sound and was calling us urgently to come to her first. We did, while Khairi leaped out to check her den, our bed room and its surround, as she usually did every time she returned after a few days outing with us.

Blackie wrapped her front legs round my right leg, crying to be unleashed. I picked her pup to my lap, a male. No sooner than had I undid her chain than she shot out without looking back, straight to Khairi.

I took Blackie's pup and mattress to the dining room and waited for her. We could hear their roving play in the western side grove. Half an hour later I had to shout at Blackie to come and take charge of her pup. She did and immediately started suckling. Khairi followed in. But when she came within a metre from the mattress Blackie growled. The six months old cub had grown more than double the size and weight of the dog. Even so, with the first growl from Blackie the little tigress just slumpped on her belly. She remained thus, limp, with curiosity oozing out from her eyes and interest inhaling into her nose. Eyeing at the pup she was nosing his smell to make out what she dare not go closer to touch. A few minutes later she stood up and slowly walked away. She could not get any closer during the subsequent two days. On the third morning I was awakened early at 4'O clock by the low growls of Blackie. Got out to see. Found Khairi crouching near the mattress, almost touching it, her persuasive silence compelling with all the patience of a tiger. Blackie was relenting in at least her love. She stopped when she saw me. Both looked up at me. The pup was sleeping snug against her mother. I lifted him and as I did, Khairi snatched him clean off my hand. She rocked him and rolled him and then holding him cosy in her soft warm paws she put his ear in her mouth. She then gently pressed it with her jaws. The pup squeaked. She pressed harder. He squealed. The little tigress promptly left his ear and started licking him soothingly all over. So at last, Khairi did get her share on her friend's pup. Blakie agreed without any more grumbling. Khairi was, thereafter, more in attendance to the pup than his own mother. On the twelfth morning after his birth, the pup was in Khairi's lap when he opened his eyes to see her first. Thence on, that tiny tot getting steadier on his legs remained almost always with the tigress. We named him Bagha which in our Oriya language means a tiger.

Bagha sometimes earned a spanking when he became naughty. When he got that he would cry hard to be heard far and wide. The next thing that I usually felt was, a silent slap on my heel. After thumping her precedence on me, Khairi would lift the pup in true cat style, by his withers held in her mouth and take him a little apart in front of me. There, putting him down on the ground she would start tenderly caressing him with her tongue, often looking at me with reprove, as much to say, "I don't like, it pa". All of us human and animal in our family have had small and large injuries from the playful claws of Khairi. Bagha has none, all these nearly six years. He is the one tuned best to the tricks of the tigress, both full grown adults, both still the greatest of friends.

In the meanwhile various kinds, small and big animals have joined our multispecies family, at different times. All of them except Ramu the male Asiatic wolf and Chhabi the female python came as very tender young ones. The wolf had been captured 26 km to the north of Jashipur. He had been run down in relay chase by the local men of two villages till he fell flat, exhausted. He was then brought to us with his limbs and muzzle tightly tied. Within one hour after I had released his bonds he eccepted food from my hand and allowed me to caress his face, neck and shoulder. Ramu stayed with us for a month. He was then shifted to Nandankanan Biological Park near Bhubaneswar, only because he is a rare individual of the endangered Indian wolf. He did not get enough opportunity to be acquainted with Khairi.

The 380 cm long python who remains with us is shunned by all animals, by Khairi the most. The tigress is innately defensive to all snakes—none else, not even the huge wild tuskers in her forest camps. The python had swallowed a small goat when she was found by the local villagers on a hill near Jashipur. While she was being captured she threw out the goat to regain mobility, but before she could move she was securely tied up. With us Chhabi is free— tame in less than three months. When she comes out in the open Bagha the dog is off, out of sight and Khairi keeps at safe distance. Jambo, the two year old male sloth stands up aback, not far, erect on his hind legs. On the other hand, Bhaina the three and a half year old male, striped hyena, blind in both eyes, goes close sniffing the python. But Chhabbi does not strike at him.

Bhaina, the hyena was found by some aboriginal women, a tiny little pup crawling all alone in the open forest about 25 km south of Jashipur. Two days after he was brought to us he opened his eyes on February 12, 1977. He opened his tender fragile eyes to the strong sun. The over too much halation damaged his retinas permanently. He remained unaware, therefore, of the relative sizes of his co-members of the family—must have felt himself to be the biggest of all, except of course me and Nihar who handled him. He started marching his territory with his anal gland smear even before he was three months old. In those early days he took full possession of our bedroom and when he grew to expand his range he tried to dominate everybody else, man and animal with snap bites. He did that to Khairi a couple of times and after that she gave him the feel of her paws. The hyena learnt. At times Khairi, however, does feel concerned about Bhaina, particularly when he gets a beating from me. Sometimes she even comes and consoles him by licking.

With the onset of winter when it gets enough cool by November for Khairi to stand the rubber foam mattress, she comes into the bedroom to sleep with her ma. Nihar has to widen her double beds with four dining chairs. In 1977, after taking possession of the

bedroom, the hyena pup did not allow Khairi to enter the bedroom till early December. Blind though he is in both eyes, his ears and nose are ultrasensitised. He can recognise all his acquaintances separately by the distinctive steps or specific smell of each. Every time he heard Khairi coming or got her approaching smell, he ran to the door to stand in her way with a chain of derisive laughs typical of his tribe. Khairi the full grown tigress never forced in. After a few evenings she kept to her outdoor bedding on bare ground. Late in the night, when it got very cold she used to move under a mango tree overlooking the open bedroom door. Towards the end of November she spent the nights mostly on her battern bed under the mango tree close to our bedroom. She never came in although she must have been wanting so much to lie cosy with her ma. I used to go near her, sometimes Nihar too, and asked her to come in, but she never did when she new Bhaina was there in the bedroom. On December 6, 1977 we could feel, by late evening, the sharp drop in temperature.

Before turning in for bed I told Nihar to persuade Khairi to come in while I took Bhaina out to the far side verandah and kept him prostrate on his back simply by scratching his belly and the underside of his neck. To him it was the windfall treat from the biggest and most dominant hyena, that was me, which I still am for him. He cares for no one else, except of course Nihar, their doting human-mother.

Khairi came with Nihar—logged 2135 hr—and saw the ten months old hyena, bigger than Bagha, playing with me. Without any more hesitation she got in and stretched herself diagonally on the double beds. A few minutes later I brought Bhaina in. Nihar feigned fast asleep in Khairi's embrace. The tigress lay with her back towards the door. The hyena must have smelt her. For he walked straight to the edge of the double beds and lifting his muzzle close to Khairi's, started scolding her with growls, barks and laughter let out in a stream of jumbled cacophony. I had to intervene: gave him a hard slap shouting at him to behave and lifted him to my bed. Khairi did not even turn to see. Thereafter Bhaina continued to share my bed till Jambo ousted him a year later and Khairi grumblingly allowed him to somehow manage into a corner of the double beds with the dining chairs.

Jambo was brought on January 7, 1979 alongwith his twin, both male cubs hardly two weeks old. Their mother had badly mauled two villagers 15 km to the west of Joshipur. She was killed by the local people and the orphaned cubs picked by them. They had severe intestinal upset. Only Jambo could pull through under intensive care by Nihar to which the other did not respond. Once he was out of woods he grew fast and naughtiest of all. I carry the largest number of scars of his playful, often painful bites mostly on my lower legs and a few on my thighs. His last bite was in the last week of June 1980, a deep

one of an almost full grown 1½ year old bear. He did amply deserve the hard caning which I gave him. The good old saying, "spare the rod and spoil the child" is nowhere so true as with the animal children—not vindictive but corrective with such love as bleeds your heart when you beat your child. The animal child can sense such love subtler perhaps than the human. Khairi, Jambo, Bhaina, Bagha and all others have amply proved.

Starting with Khairi, here at Jashipur, our animal children have come at different times but grown up together under such discipline tempered with much love and influenced by the fellow feeling. Jambo is the most loving and lovable of all. He is the only one to whom Khairi comes and greets, and when she does that Jambo stands up on his hind legs and putting his bushy, burly arms around her neck gives her a good hug—only when she asks for it, not otherwise. The bear values the ontogenic respect that the tiger has earned. Jambo is a hale-fellow-well-met to one and all. He is the most lively and endlessly restless—gate crasher, fence leaper, door ripper, cupboard breaker and ever so many otherwise pranker. Bhaina is his most intimate friend. From the very first day he took to our hyena the way all tender young ones do.

They accept Bhaina spontaneously without any hesitation—bear cubs, jackal pups, kittens of jungle cat, leopard cat, palm civet, small Indian civet and mongoose, pigling of wild boar, fawns of barking deer and four horned antelope. All of them, without exception, have responded to him as if they had at last found their much loved old friend, a universal baby-sitter. I wonder if it has anything to do with the body smell of the hyena or is it something with the ESP of the baby. I have wondered more, if it could be the reason why a wild hyena is so very repeatedly successful when he takes to silently lifting the human child from the lap of its sleeping mother. Bhaina does lift our animal children, but with tender care, and never stealthily.

Khairi is selective. Besides Bagha she used to play with Manika the four horned antelope who was accidentally killed during her last play with the tigress. Jambo too drew her interest as a cub. She used to take him round in her mouth like she had done to Bagha. Jambo keeps his friendship both with Khairi and more with Bhaina. All others so intimate with the hyena when they were young, have, when they grew up, parted company with Bhaina. Some of them have only twosome friendship like Pukul the jungle cat with Jhuna the mangoose, Beda the wild boar with Tinwa, the small Indian civet and Chumki the leopard cat with Jhuni the mongoose.

Very sadly for us, one unguarded morning when Jhuni ran joyously out to the lawn, Nihar saw Blackie and Bagha sweeping in from nowhere. Before she could rush to save the mangoose, Blackie nosed her under a flower bush and by the time Nihar reached there it was all over. Chumki felt very much the loss of her friend. Within a few days she

too left us for good. Those territorial dogs were, thereafter, kept leashed except for their daily exercise.

No marking of any territory is apparent with Jambo, the bear and Beda the boar. The cats including Khairi do by squirting urinary jets. The hyena, small Indian civet and the mangoose mark with anal gland smears and the palm civet, otherwise known as the toddy cat, does by placing its faece swabbed with the anal secretion. But territorial or non-territorial, any conspecific conflict has not interfered with their mutual fellowships in the family, nor has the still greater conflict in nature between the predator and its prey.

A much challenging playmate of Khairi during her adolescence was Manika a female four-horned antelope. In nature she would be a very palatable prey animal of the tiger. She had been brought to us in mid-June 1975 with her twin brother, both in much run down condition, perhaps orphaned. They had been picked in the hills 15 km to the north east of Joshipur, the two together, tender fawns about a month old. We had just then returned from a long tour in the forests of Central Orissa. We had been there to investigate about a notorious child-lifter, an unknown wild animal supposedly with a black face and white body. People thought it was the devil incarnate. Khairi had gone with us and her dog friends too. At that time they were the only three with us. Nine month old Khairi then 214 cm long round the curve, standing 69.5 cm high at shoulder and weighing 64 kg. She looked impressively big, bigger than a panther. And, she did carry a lot of confidence to the people harassed by that child-lifter, in the Khamar P.S. of Dhenkanal district. Simple hearted, superstitious rural folks as they were, they believed that because I had a free living tiger with me, unheard of in history, I had been god sent, bringing a tiger with me to deal with that devil. I capitalised on their belief to reinstil the confidence in their own superiority as human beings. It was a child-lifting hyena who was determindedly searched for and was done to death by the people themselves once they were convinced that it was none but an ordinary hyena who had been stealthily lifting the human babies from their sleeping mothers. In her contacts with innumerable village folks who came from far and wide io meet her, Khairi appeared to be enjoying the 'show off' and was certainly very sociable to every one of them. After her return to Joshipur she remained friendly to one and all. She saw the two four-horned antelope fawns when they were brought to us. She came in and met them on the very first day of their arrival. After some innate hesitation the fawns ultimately broke their reticence to get acquainted with the tigress. Later, Manika who survived became a very good friend of Khairi.

Manika picked up health on bottle feed combined by and by with browse supplemented by green vegetables. As she grew, she became very partial to the egg fruit and the French beans kept in the lowest compartment of the refrigerator. Whenever Manika heard or saw Nihar opening the frige door she came running to nudge the vegetable tray while she whimpered to her ma to give her a piece, which Nihar lovingly did. Every morning

when Nihar woke up to make tea, Munika would immediately leap out from her bunk at the far corner of the bedroom, and start muzzling the frige door while she impatiently stamped her hind toes with continuous bleating for the brinjal and the bean. That way, all of them know about that larder of the dainties. For the tigress it is the monkey, deer and antelope meat, for the hyena the various meat, sweets, cakes and ripe fruits, and addedly for the bear are the honey and the ant eggs.

Sometimes when Babulu my son shoots a monkey for Khairi, she takes it in her jaws and leaps around to show her happiness. She then brings it back to be dressed and served in her next meal. At times when Nihar gives, instead, the left over goat, Khairi takes a distant sniff and goes to the refrigerator. There she stands, her nose close to its deer while she voices her request mainowing and cooing, as much to say, "Ma, take the monkey out and give it to me. Please Ma". Can anyone resist that, and of all Nihar her dearest ?

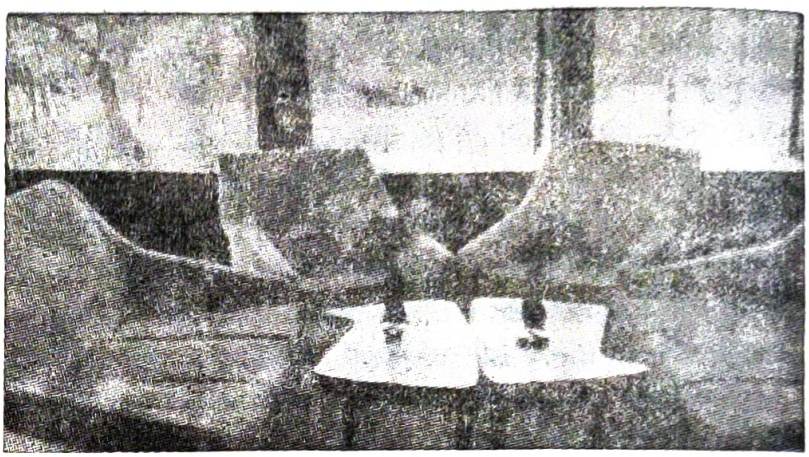
Bhaina is a little less civil. He does not get the smell of the sweets sealed behind the door. But he knows, they are there in the frigs. He marks time when things appear favourable, particularly in the voice of his ma. And then he is there at the opportune moment, asking Nihar in low sot whimpers. When his whispers fail, he ways his sight foreleg often striking the frige door with its nails. Nihar has to give him something at least to send him out.

Jambo is different. He does not stand on any ceremony whatsoever. When he finds the dining room door open or is able to unlatch the door not under lock which he can easily handle, he just burgles in, hastening to the bigger frige, wrenches its door open, picks any apple and runs if he finds anybody coming. When he does not see anyone nearby he bites a few to choose the real ripe one before making good his escape. The tell-tales he left of such exploits were loud. So, Nihar has to tie now a thick steel chain round that refrigerator to save not the food so much as the frige itself.

Khairi picks her food, the raw meat with bones, by hooking it to the thick incurved barbules on her tongue. She uses the carnassials, her molars, to cut a chunk in, which she gulps. The meat is liquified by her stomach juice for further digestion down the line. No mastication nor saliva is necessary.

Beda the wild boar on the other hand munches even his liquid food. He holds the full complement of mammalian denture with 44 teeth in both jaws sized for the widest ranged omnivory. He makes full use of it on solid or liquid, starch or no starch, to make sure in micromincing his food and soaking the particles with sufficient saliva for digestion. When his stomach is full he often places his snout on the floor or against a vertical surface and moves his mouth as if he is ploughing and picking some underground food. The spot around his snout soon looks wet with saliva. Beda does such pseudo-feeding, apparently, to produce extra saliva to promote his digestion. In nature, his kind are the most efficient and all pervading converters of both plant and animal matter to succulent wild pigs.

Have a drawing-room view of wild animals



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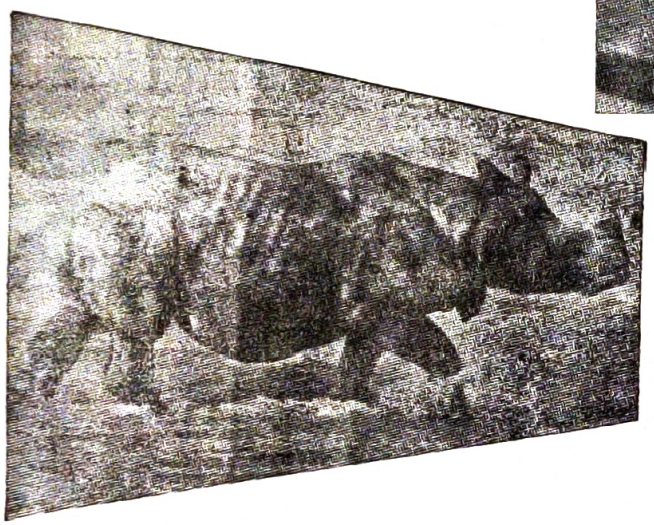

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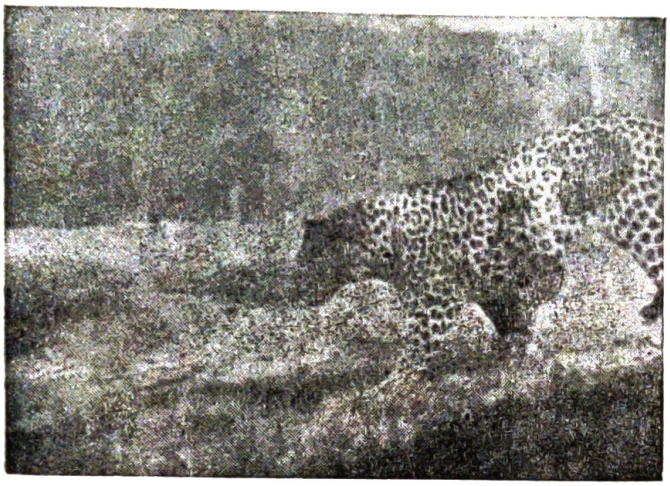

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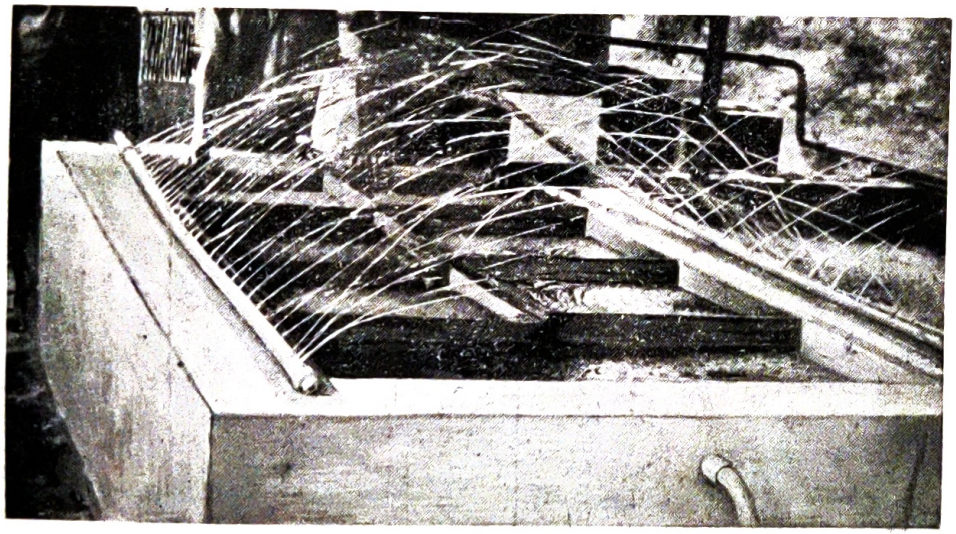
A pair of mahseers, Tor Khudree upper male, lower female.

Stripping of mahseer and spreading of milt over the eggs in the tray.



Hatching trays in hatchery tank with water spray arrangement.

(Reference Article on Page No. 24)

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Edited by Dr. R.N. Misra, Dr. S.K. Sangal, N.K. Jain and Published by Dr. R.N. Misra, Hony. Secretary for the Wildlife Preservation Society of India (Phone: 25392, Gram: Cheetal), 7, Astley Hall, Dehra Dun and Printed by T.C. Sharma at Dun Printing House, Rajpur Road, Dehra Dun.

Published on 30/3/82